HEALTH BUILDING NOTE 29

MC0130

# Accommodation for Pharmaceutical Services

DEPARTMENT OF HEALTH AND SOCIAL SECURITY
WELSH OFFICE

# Health Building Notes

Health Building Notes (HBNs) are intended to assist those involved in the briefing and design stages of schemes to provide new health buildings or to adapt or extend existing premises. The Notes contain information on relevant aspects of service objectives, functional requirements and design. They establish standards of accommodation that are consistent with the functional requirements and form the basis for deriving Cost Allowances.

The functions, activities, equipment, environmental conditions, engineering services and dimensions which are critical to the efficient performance of an activity, are identified and discussed but no preference for any particular configuration or plan is implied. Optional solutions with cost implications are indicated, where appropriate, leaving local planners to make their own choices.

Reference is made in the Notes to the related Design Briefing System and also to Activity Data sheets which provide the detailed user requirements for each room or space.

Guidance on spaces common to all health buildings has been brought together in HBN40* "Common Activity Spaces", to which reference is made where appropriate in each Note.

HBNs are prepared in consultation with representatives of the National Health Service and appropriate professional bodies.

*HBN40

- Volume 1 - Clinical, Sanitary, Administrative and Associated Spaces
- Volume 2 - Corridors
- Volume 3 - Lifts and Stairways } in preparation
- Volume 4 - Designing for Disabled People } in preparation

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# 1 Scope

## Introduction

1.1 This Health Building Note replaces Hospital Building Note 29, issued in April 1973; it has been prepared to assist health authorities to meet the needs of a hospital pharmaceutical service which reflects current Departmental policy. In the interests of clarity a glossary of pharmaceutical terms (Appendix 1) has been included.

1.2 The organisation of the hospital pharmaceutical services has undergone fundamental changes since the publication in 1970 of the Report of the Working Party on the Hospital Pharmaceutical Services chaired by Sir Noel Hall (hereafter referred to as the 'Noel Hall Report'). This report proposed an 'area' arrangement for management of the service whereby each 'area' - comprising 4,000-6,000 hospital in-patient beds of all categories - would be served by one or more pharmaceutical services which would be integrated managerially to provide for the economic use of staff and resources, encourage a degree of specialisation and give greater economies in the scale of such activities as bulk manufacturing. The Noel Hall arrangements were being set up locally just prior to the 1974 NHS reorganisation which imposed a similar pattern of organisation on the hospital service as a whole as well as bringing Local Authority clinics (renamed community health clinics) into the NHS. The clinics are now supplied by the hospital pharmaceutical service. Since then, rationalisation of beds and the 1982 NHS reorganisation have also had an impact on the provision of pharmaceutical services.

1.3 As well as the Noel Hall report which encouraged specialisation within the pharmaceutical services, the requirement in 1975 that manufacturing activities and facilities should conform to the "Guide to Good Pharmaceutical Manufacturing Practice" further increased the differences in function of the primary patient-orientated pharmaceutical services, and support services such as manufacturing. (Departmental advice has also subsequently developed as regards manufacturing). The underlying principle of Departmental guidance is that the NHS should engage in manufacturing only if there is no satisfactory commercial source or it is significantly more economical to do so. In order to determine this it will be necessary to cost manufacturing units or proposed units. For these reasons manufacturing services are considered as a separate function later in this Note, together with the allied quality control service which has developed substantially since 1975.

1.4 Another specialisation that has developed over the past decade is that of drug information. Many reports have noted the individual pharmacists' potential role of advising medical and nursing colleagues on topics such as the storage of medicines on wards and the availability of different drug formulations. This role has grown with the development of specialised drug information centres within the pharmaceutical service to support this function as well as to assist pharmacy staff to keep abreast of current developments and help in training programmes. As the information held by these centres is patient-orientated and is disseminated by the pharmacists visiting the wards, drug information has remained closely associated with the primary services.

1.5 The current picture of the pharmaceutical service is that of a service provided at individual hospital level by a hospital-based primary service department either in that hospital, if it is of reasonable size, or by a department in a nearby hospital for smaller units. Within the pharmaceutical area, set up under the Noel Hall arrangements, several of these hospital departments are supported by a more specialised manufacturing and associated quality control service (not necessarily attached to any primary services department). A specialist drug information centre may also be associated with one of the group of primary services departments. Although the numbers of staff employed in a typical pharmaceutical area cannot be given with precision, accomodation requirements are determined by storage considerations and by the nature and extent of the equipment used, particularly in such areas as manufacturing.

1.6 Whilst the above arrangements for the pharmaceutical services predated the 1982 NHS reorganisation, the Department has re-emphasised the Noel Hall considerations in HC(80)8, "Health Services development, structure and management", in an effort to avoid large scale distortions of these arrangements. Given the Department's advice that manufacturing should be done only if the products are not available from industry, or if it is demonstrably cheaper to do so, it is important that planning of developments in pharmaceutical services is co-ordinated by Regional Authorities.

1.7 A further growth of the service could come with the centralisation within the pharmaceutical area of purchasing and distribution services which would order goods on behalf of all hospitals in the area and control the total amount of stock held. Such services, facilitated by computer installations, would be expected to be self-supporting but may be more economically linked with manufacturing than primary pharmaceutical service elements.

1.8 This guidance takes account of the latest thinking in the design of pharmaceutical departments. It is intended to facilitate good management and achieve lower running costs. Every care has been taken to ensure

that the guidance and recommendations for this accomodation are as economical as possible without detriment to pharmaceutical standards.

**Inclusions**

1.9 Guidance is given for:

a. provision of primary services for 450-600 beds and a larger provision of primary services for 600-1,200 beds (some of these beds may be off site); if local proposals are made to meet a lower level of demand, an ad hoc solution following these principles would be appropriate.

b. provision of drug information services

c. manufacturing and quality control support services

d. purchase and distribution

e. facilities for radiopharmaceutical preparation.

**Exclusions**

1.10 This Note does not give guidance on pharmaceutical dispensing arrangements at small or day hospitals or health clinics.

**Design Briefing System (DBS)**

1.11 The DBS is a series of notebooks which are used in conjunction with new or revised building notes to help specify user requirements for a Design Brief. Each notebook adopts a check-list approach, providing a framework which guides the project team through the consideration of organisational and planning options, and leads to a list of activity spaces. Although the application of DBS is confined mainly to planning new facilities, it can be used also to prepare a brief for extensive upgrading of existing accommodation. Health Building Notes published by HMSO are accompanied by the relevant DBS notebook. Further information about DBS can be obtained from Room 625 Euston Tower, 286 Euston Road, London NW1 3DN (tel: 01 388 1188 ext 3382).

**Health Equipment Note (HEN)**

1.12 The guidance on equipment for a pharmaceutical department in the existing HEN29 is no longer relevant to this health building note. Consideration may be given in due course to the preparation of new guidance.

**Works Guidance Index**

1.13 This HBN provides guidance that is current at the time of publication. Specific issues such as medical gases, arrangements for dealing with high risk infectious diseases, fire, energy conservation etc, are covered by other published guidance which must also be taken into account. Some aspects of the guidance in this HBN may from time to time be amended or qualified and it is necessary for project teams to check with the current edition of the Works Guidance Index. The Index is published by the Department in May each year and updated in September and January.

**Cost Allowances**

1.14 The Cost Allowance associated with this building guidance is promulgated in an Annex to the Health Notice HN(87)25. The room areas in Chapter 9 are those used in preparing the Cost Allowance. They may be used as a guide in preliminary planning, but must under no circumstances be treated as a maximum or as an entitlement.

**Capricode**

1.15 Capricode is the mandatory procedural framework governing the inception, planning, processing and control of individual health building schemes. The aim of Capricode is to promote a consistent and streamlined approach to capital development that achieves best use of resources through the selection and construction of relevant and cost effective schemes that open on time and within budget. It identifies the main activities and provides a framework for delegation with effective management and the proper accounting for expenditure and performance. (See 'Capricode Health Building Procedures' issued with HN(86)32 in October 1986).

# 2 General Pharmaceutical Service Considerations

**Purpose of the service**

2.1 The purpose of the hospital pharmaceutical service is to provide the appropriate medication for the patient as authorised by the medical staff. Its activities include:

a. dispensing for individual patients, including dispensing certain items aseptically

b. supplying stocks of medicinal products to wards, departments and community health clinics

c. the provision of advice and information to patients and to medical and nursing staff

d. the education and training of pharmacy staff

e. the manufacture and quality control of medicinal products only when it is significantly more economical to do so.

**Dispensing and the supply of ward stocks**

2.2 Dispensing covers a range of techniques where stocks of drugs or raw materials or both are manipulated to produce a medicine which fulfils the prescribed requirement for an individual patient. Not every item supplied within the hospital needs to undergo manipulation however, since certain medicines are already presented in a form suitable for issue as ward stocks. Different methods of drug distribution in hospitals have been reviewed recently by J. K. Bush. (see Bibliography)

The pharmacist has an advisory role on the ward.

2.3 With the exception of radiopharmaceuticals, items prepared for a named patient for immediate dispensing in accordance with a practitioner's prescription are not covered by the provisions of the Medicines Act.

**Pharmacist's role**

2.4 The advisory role of the pharmacist in the hospital has been reported upon in both the 'Linstead Report' and the 'Noel Hall Report'. Together with traditional dispensing skills (as outlined above) important consultative roles have emerged with regard to medical and nursing staff, such as playing a key role in drug and therapeutic committees, and drug and dressing contract procedures. This advisory role has been extended to ward activities with the pharmacist answering specific requests for information on presentation, storage and use of drugs and giving advice to patients about taking their prescribed medicines.

2.5 Pharmacy departments in association with day release study courses frequently undertake 'on the job' training for technician grades. Pre-registration pharmacy graduates also undertake a year's work experience prior to obtaining registration as pharmacists, and their hospital year generally includes a co-ordinated study programme. "Refresher" courses and seminars assist pharmacists in keeping up to date in pharmaceutical practice.

2.6 A network of technical information rooms in primary service departments and specialised drug information centres provides pharmacists with a back-up of pharmaceutical and other technical literature and facilities for study and information retrieval.

**Manufacturing services**

2.7 Manufacturing services (manufacture and assembly) have been evolving from their intimate connection with primary services towards a larger scale of operation, perhaps covering more than one pharmaceutical area. The Department's policy on manufacturing is given in health circular HC(84)3, "Manufacture of products in the NHS". (Appendix 2) The policy is that manufacturing activities of health authorities should only be undertaken if:

i. there is no satisfactory commercial source, or

ii. it is significantly more economical to do so.

Where manufacturing is carried out it is essential that the *full* cost of the operation be established not only for internal information and to determine realistic prices for inter-authority transactions, but also to ensure proper comparisons with outside prices where appropriate. For this purpose, memorandum manufacturing accounts and profit and loss accounts should be prepared covering not only direct manufacturing costs but also overheads, cost

of capital, back-up services, documentation, etc. Authorities should monitor the results of costing and take appropriate action. Detailed guidance is given in the Appendix to the Circular. Arrangements will be subject to examination by statutory auditors in the usual way.

2.8 In addition, the Medicines Act 1968 made the commercial manufacture of medicinal products subject to strict licensing procedures and health authorities were required to introduce corresponding arrangements by the terms of Circular HSC(IS)128 (in Wales, WHSC(IS)136). These arrangements require that the premises and facilities of a hospital's manufacturing unit - new or upgraded - should meet the required standards, as indicated in the "Guide to Good Pharmaceutical Manufacturing Practice 1983". Medicines Inspectors will visit premises and report on their suitability. Health authorities are therefore urged to seek the comments of the Medicines Inspectors at the planning stage on whether or not the proposed unit is likely to be acceptable.

2.9 Manufacture or assembly can be defined in this context (but see 2.3) to include:

a. the preparation of any radiopharmaceutical product.

b. the preparation of any biological product or products containing a steroid or antibiotic.

c. the preparation of medicinal products other than a. and b. for immediate dispensing or adminstration.

d. the assembly (ie placing in immediate use containers) of medicinal products by automatic machinery.

2.10 The manufacture of medicinal products can be broadly divided into sterile and non-sterile production. The former involves procedures designed to eliminate contamination by viable micro-organisms, while contamination control for the latter is not quite so rigorous. Many items for topical use need to be prepared under clean environmental conditions particularly if they are to be applied to broken skin. Grouping these services in one location can avoid duplication of some facilities and provide greater flexibility in the use of resources. The siting of a group of such facilities need not be adjacent to a primary services department. The necessity of staff rotation as well as mixed duties in smaller units should not be overlooked, and it is desirable for such practices to be developed within the curtilage of a large hospital.

2.11 Manufacturing and quality control processes demand a wide range of highly specialised equipment, carefully sited for ease of use and maintenance. Manufacture may generate wild heat which must be dissipated, dust which must be extracted, or require closely-controlled ventilation for a dust-free atmosphere. Special work-tops or vibration-free mountings may be required. The location of waste disposal outlets needs to be established at an early stage of planning.

**Quality control**

2.12 Quality control forms an integral part of good manufacturing practice and this is reflected in the "Guide to Good Pharmaceutical Manufacturing Practice". For this reason a quality control service is likely to be provided alongside manufacturing elements and should be included in the costing of the manufacturing process. (2.7) Where this is not possible, rudimentary on-site quality control facilities will still be required. The philosophy underlying quality control has an important part to play in drug contractual procedures and monitoring environmental standards, so the service is also supportive of primary services. Because of the high cost of certain specialised equipment, individual quality control laboratories within a region may perform particular tests for the whole region.

**Purchase and distribution**

2.13 There is a growing awareness that cost effective purchasing and distribution services for the hospital pharmaceutical services should be on a similar basis to other support services, such as manufacturing. The need for control by the pharmacist of the purchase and distribution of medicinal products in the individual hospitals has been established by various reports including those mentioned in paragraph 2.2. More recently the Department sponsored a study into centralised purchasing of medicinal products for an individual pharmaceutical area: "An evaluation of the centralisation of Pharmaceutical Supply", NCB/ORE, 1980; which indicated that the setting up of a special store would be more cost effective than fragmented storage at the individual primary service units.

# 3 General Design Considerations

## Environment

3.1 Good interior design can contribute to staff morale and the aim should be to create a pleasant and cheerful environment throughout the department within the constraints of pharmaceutical requirements. Natural ventilation and natural or borrowed light from adjacent spaces should be provided whenever the building form and pharmaceutical considerations permit.

3.2 Landscaped internal courtyards will enable more rooms to receive natural light and ventilation provided that they are accessible, economical to maintain and that privacy and security in the surrounding rooms can be maintained. Natural lighting and ventilation are of particular importance in areas such as the staff room, seminar room, offices, main dispensing and ward service area and out-patients waiting.

## Security

3.3 Good security is an essential consideration because the medicinal products stored and used in a pharmacy are always at risk from attempted thefts. The Misuse of Drugs (Safe Custody) Regulations 1973 lay down strict security requirements for Controlled Drugs but precautions against theft will also be required for other substances and for money collected for prescription charges. The whole department should be planned as an integrally secure area with all entrances capable of being controlled. The project team should discuss hospital security with the officer in charge of the Police Crime Prevention Department and the hospital or district security officer or advisers. Fire and Security Officers should be consulted concurrently at an early stage in the design of the building, for the demands of security and fire safety may sometimes conflict.

3.4 Security arrangements for the department should be compatible with those for the whole hospital. The 'mastering' of keys and their availability outside normal working hours are matters for local decision.

## Staff protection

3.5 The physical protection of pharmacetical staff from assault in the course of a theft must not be overlooked. There are times when the numbers of staff on duty may be minimal, eg during lunch breaks or late at night. Protective measures, eg self-lockable doors or barriers and alarm buttons, will be a priority requirement, particularly at places like the patient services counter in the dispensary. (4.20)

3.6 A wide range of potentially harmful materials - including volatile solvents - may be stored, prepared and dispensed and supplied by a pharmaceutical department. Special attention must be paid to the provision of safe working conditions and procedures under the terms of the Health and Safety at Work etc legislation.

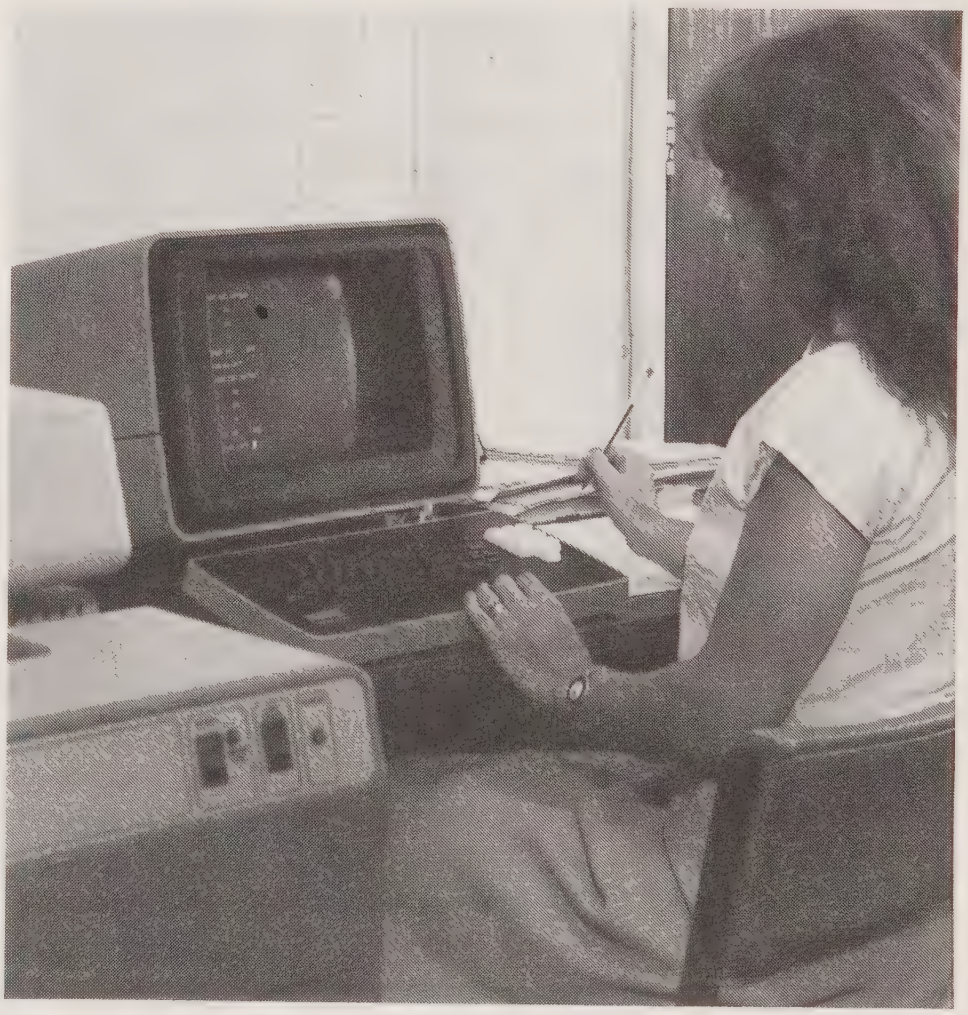
## Waste disposal

3.7 The return of waste from wards to the pharmacy can often include a residue of medicinal products of a potentially harmful nature. Similar waste may be generated by the pharmaceutical manufacturing or quality control processes. A code of practice for the disposal of clinical waste (which in this instance includes waste medicinal products) has been published by the Health and Safety Executive and waste disposal methods adopted should be in line with this code. Waste organic solvents (eg from laboratories or manufacturing processes) should be disposed of in accordance with the Department of the Environment's Waste Management Papers 14, 15 and 19. The disposal of radioactive substances demands special controls (see Chapter 8).

3.8 The programming of waste collection is a matter for local decision, but planners can facilitate these tasks by allotting space for the waste to be held, pending removal, in suitable containers and in an accessible location.

## Use of computers

3.9 Computing expertise is now widely available in the NHS, and project teams should ensure that, at an early stage, they are aware of current national and local computing policies, and that their proposals conform with them.



Computers can be used for stock control.

3.10 Although at the time of writing it is not clear how extensively computers may come to be used in hospital pharmacies, possible facilities for computer equipment and its integration with larger computer systems should be borne in mind, particularly when engineering requirements are being considered. Areas where computers are used are stock control, container labelling, information storage and retrieval, production/quality control records and for calculation purposes.

**Other space requirements**

3.11 In hospitals where large scale research is carried out, special experimental equipment may need to be housed in the pharmacy. The storage of clinical trial materials may also require special consideration.

# 4 Functional Requirements for Primary Pharmaceutical Services and Drug Information Services

4.1 This chapter enlarges upon the objectives, functional requirements and design implications of the principles described in Chapter 2 for primary pharmaceutical services and drug information services. Full details of activities, equipment, environmental conditions, finishes of walls, floors and ceilings are given in the Activity Data sheets listed in Chapter 10.

4.2 The following description of facilities for primary services is based upon a department serving 450 to 600 beds and out-patients, together with day hospitals and community health clinics situated nearby. Figure 1 indicates the relative strengths of these relationships. Paragraph 4.75 outlines the way this guidance can be applied when serving a larger number of beds (up to 1200).

4.3 Additional planning considerations are that the type and volume of treatment procedures undertaken can have consequential effects on pharmaceutical services in terms of accommodation and manpower. Teaching hospitals, for instance, may make heavier demands on the pharmacy whereas the workload may be lighter in long stay hospitals.

## PRIMARY SERVICES REQUIREMENTS

4.4 The following accommodation will be needed:

a. dispensing section
b. sterile dispensing suite
c. laboratory and container cleansing support
d. ward service area
e. storage for bulk stocks
f. staff offices, including a technical information room
g. staff amenities.

### Location

4.5 In locating pharmaceutical services within a hospital the following requirements should be borne in mind:

a. The pharmacy stores complex should be easily accessible from the main goods reception area so that pharmacy staff can take immediate delivery of goods. If stores are sited away from the pharmacy special arrangements would need to be made for a secure transit system of goods.

b. The dispensing section of the pharmacy should be located near to the out-patients' department. If this cannot be done then a separate out-patients' dispensary would have to be provided. This would be undesirable because of the implications for security, staffing and the duplication of stockholding.

c. To avoid cross-contamination the pharmacy should be sited away from departments such as the mortuary and the waste disposal area.

d. Ideally, there should be a close link with the main hospital routes for the easy distribution of pharmaceutical preparations to wards and departments, and accessibility for the medical and nursing professions.

e. Paragraph 3.3 recommended that the whole pharmacy department should be planned as an integrally secure area with all entrances capable of being controlled. In particular, the total number of entrances from the exterior should be minimal, with attendant supervision to deter unauthorised access. In addition, there should be no corridor traversing the department which is used as a link between other departments. Integration of the pharmacy is more effectively achieved by positioning it on a single floor rather than on two storeys which normally increases the number of access points.

4.6 The above requirements indicate that the ground floor is the best location for the pharmacy and that there should be a close relationship between the various functions. Separate arrangements will be needed for the storage of flammable materials and gas cylinders. (4.64, 4.65)

### Relationships

4.7 The internal relationships in the department are shown in Figure 2 which indicates that the dispensary is the hub of the department. External relationships are also important for the out-patients service, ward service, technical information and stores section, which should therefore be planned appropriately on the periphery. Apart from administrative offices which should be adjacent to the dispensary for supervisory and communication purposes, staff accommodation generally should not be positioned in the high priority area surrounding the dispensary. The positioning of the sterile dispensing suite should have regard to its engineering requirements and supervision from an adjacent area which is continuously manned during normal working hours.

### Dispensing section

4.8 The dispensing section provides facilities for dispensing and compounding prescriptions for in-patients and out-patients, as well as providing a base for ward pharmacists. It comprises a dispensary, ward box holding store, and out-patients service counter with associated waiting and advisory facilities. When the section is situated some way from the out-patients' department, a separate small dispensary may be required. The main dispensary would then only serve in-patients.

### Dispensary

4.9 The dispensary receives prescriptions either directly from the wards or via the ward pharmacist when visiting

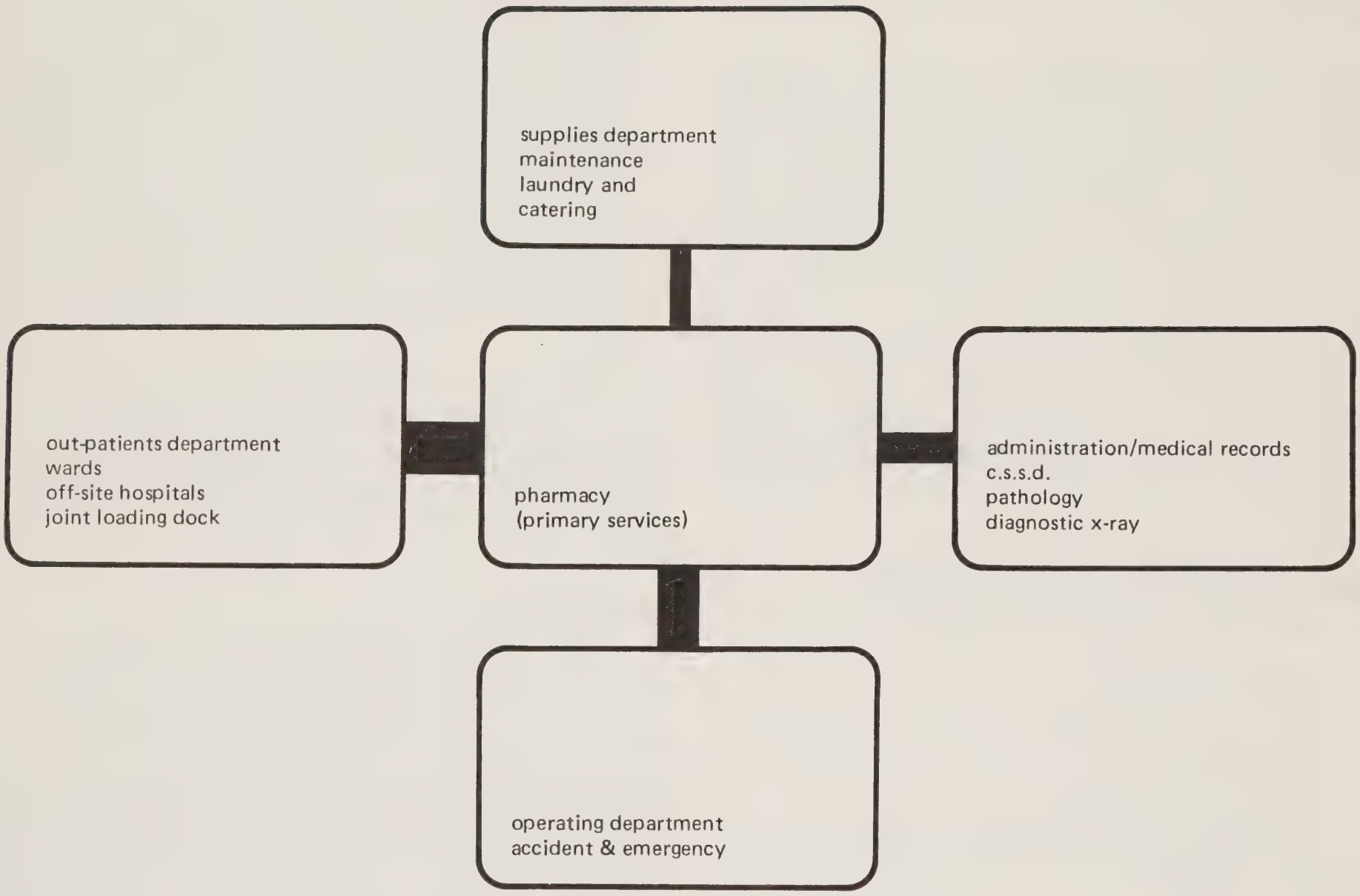



FIGURE 1 Traffic density between a pharmacy department providing primary services & other hospital departments / hospitals

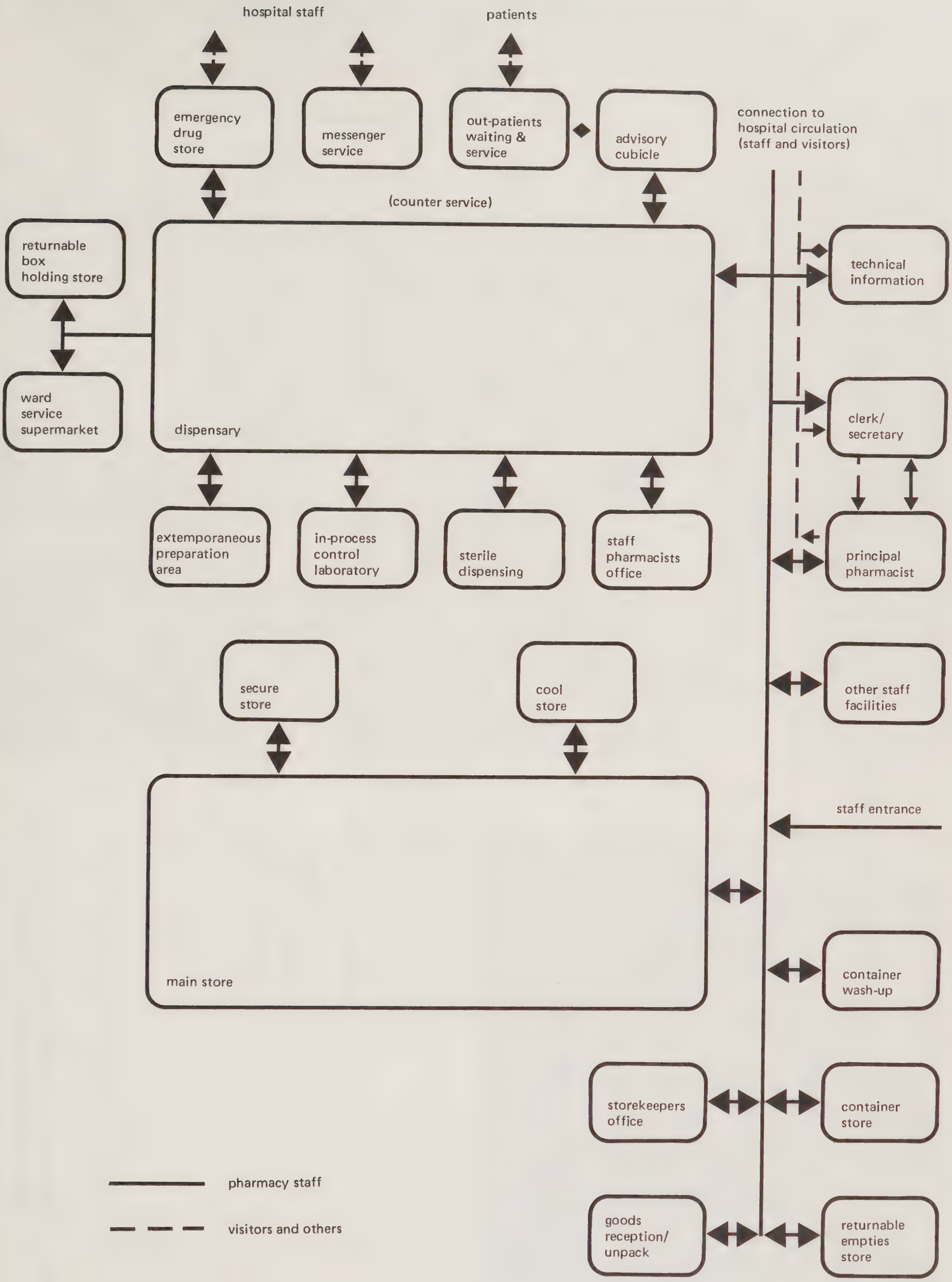



**FIGURE 2 Intra - pharmacy relationships: flow of persons between main work areas**

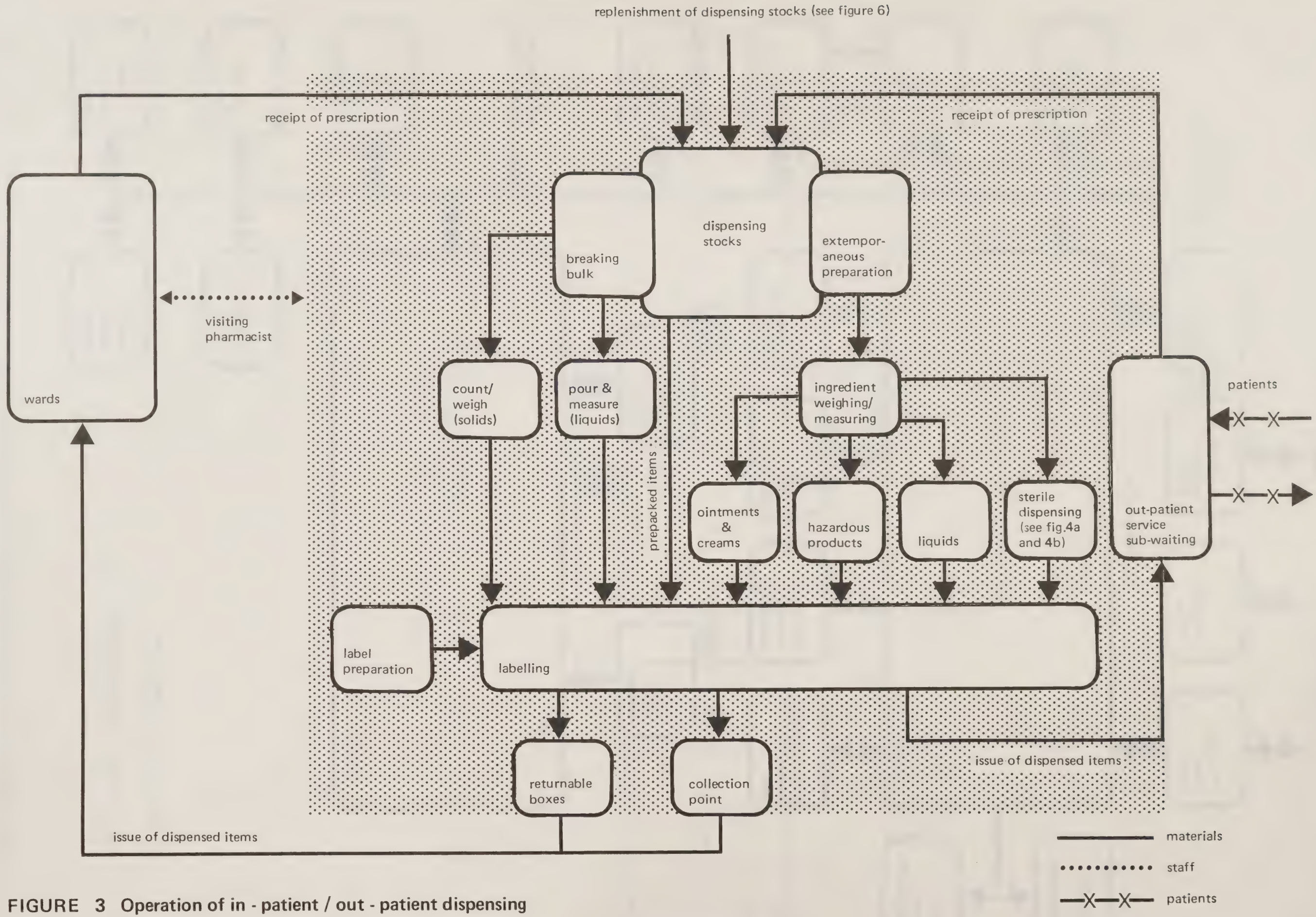



**FIGURE 3 Operation of in - patient / out - patient dispensing**
(Activities within the Pharmacy indicated by shaded area)

A dispensary

the wards. Generally, a lockable service point will be required for the ward messengers bringing prescriptions or requesting items required urgently.

4.10 Dispensing operations taking place in the dispensary (Figure 3) generally involve breaking bulk quantities into small quantities, preparing products from the raw materials and then placing into suitable containers and labelling.

4.11 Open shelves are often used for holding dispensary stocks of medicinal products and raw materials; these shelves may be adjustable and should be able to accommodate varying pack dimensions. An alternative form of storage which requires less floor space is a mechanical system of rotating shelves. Cupboards and drawers will also be required; they should not be installed close to heat sources (pipes, radiators etc) which may cause the deterioration of medicines stored there. Work surfaces are often incorporated into storage fixtures for ease of use.

4.12 Dispensing operations often use electronic counting devices, liquid measures and small balances which require level and stable surfaces, electric socket outlets, and washing sinks with hot and cold water (The type of

Use of rotating shelf-storage unit

taps used is a matter for local decision but they need not necessarily be of swan-neck laboratory type.) A supply of potable water, sterilized or freshly distilled, or drawn from rising mains, will be required for the preparation of some medicines, eg children's antibiotic mixtures.

4.13 A grease-resistant section of bench should be allocated for the preparation of small quantities of ointments, creams, or suppositories. Any heating should be done electrically, eg by an electrically heated ointment slab or electric water bath.

4.14 Similarly, another area fitted with stainless steel sinks should be set apart for the preparation of small quantities of solutions and other 'wet' products. If working stocks of flammable liquids are kept here, a lockable steel cabinet of an approved design will be required.

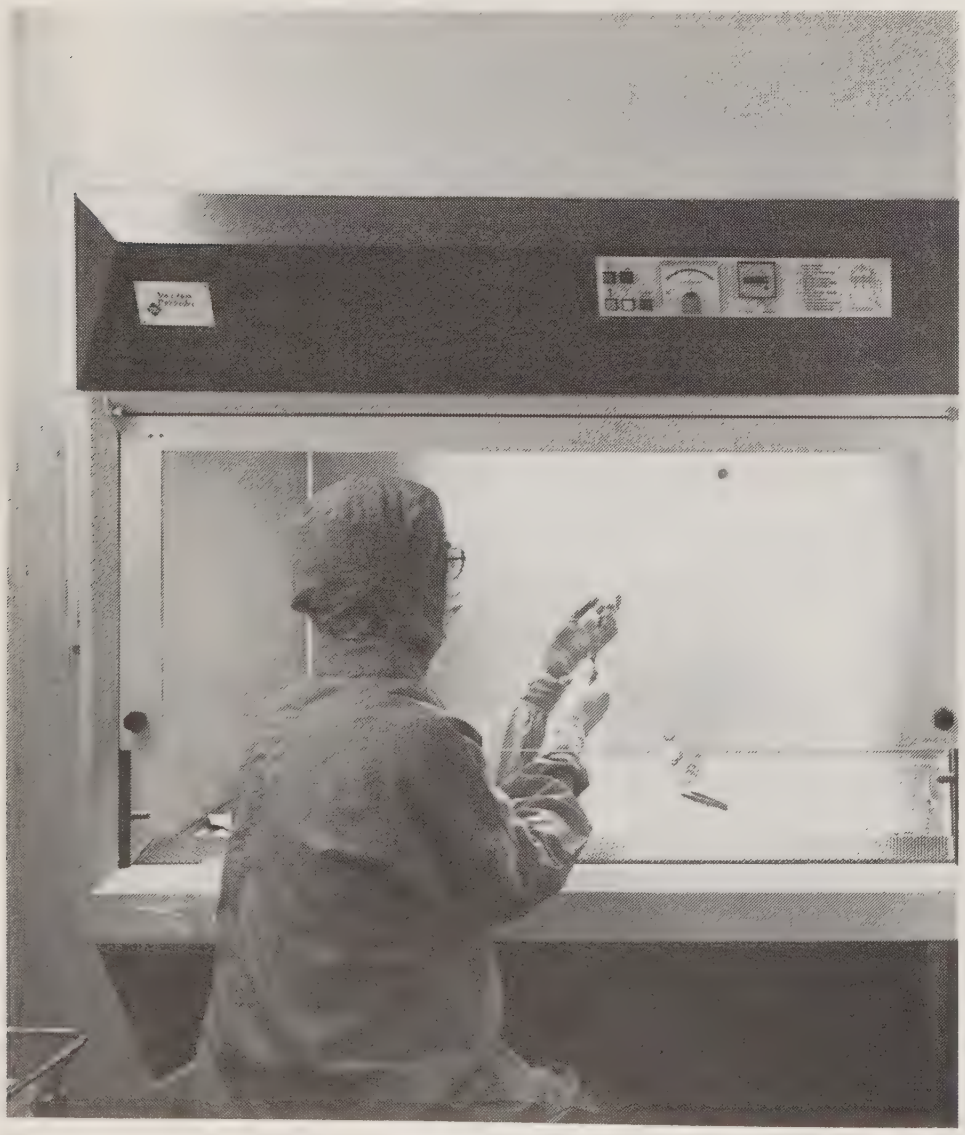
4.15 Special typewriters or computerised facilities will be required for the production of labels for dispensed items.

**Controlled Drugs**

4.16 Special storage arrangements are needed for those medicinal products which are open to abuse. If a working stock of Controlled Drugs is to be kept in the dispensary it will require a security cabinet of approved design, with audio-visual alarms plus an alarm connected to a continually manned location (see paragraph 3.3). Bench space next to the cabinet will be needed for making entries in the Controlled Drugs register.

**Hazardous substances**

4.17 A certain group of preparations, eg those with alcohol bases or irritant ingredients, present a hazard to staff dispensing. A separate bench area must therefore be provided and equipped with a fume hood extractor, or some other means of rendering the atmosphere innocuous.



Preparing a cytotoxic injection

4.18 The pharmacy may undertake the preparation of cytotoxic agents for individual patients. The facilities required for these operations are currently the subject of professional debate, but it seems likely that a 'microbiological safety cabinet' will be required, complying with Class II of BS 5726 with downward airflow and located in an aseptic area. The airflow in the cabinet should comply with Class 1 of BS 5295. Cabinets purpose-designed for use with cytotoxic agents, have recently been introduced in this country. The Health and Safety Executive have issued a Guidance Note (MS 21) suggesting precautions for the safe handling of cytotoxic drugs which those planning to set up a cytotoxic preparation service are advised to consult.

***Note:*** The installation and maintenance of microbiological safety cabinets and laboratory fume cupboards is discussed in Health Equipment Information No 86 issued in June 1980. Advice concerning laminar flow workstations is given in HEI No 67 issued in February 1977.

**Ward box holding store**

4.19 Dispensed items and stocks (4.39–4.43) are sent to the wards, departments and clinics in locked boxes which are later returned empty to the pharmacy. Thus an area is required to hold these boxes, which may include those from wards in other hospitals and from community health clinics. Medication carts are being introduced in a number of hospitals. Although these carts remove the need for returnable ward boxes, there may still be a requirement for holding the cassette sections of the carts prior to returning them to the wards.

**Out-patients' service counter**

4.20 A service counter is preferred to a service window for the receipt of prescriptions and issuing dispensed items but it should be so positioned that the dispensary is not open to the view of patients. The need for staff security should be borne in mind. The counter could be partitioned into a few bays so that pharmacists can talk to patients in relative privacy. Accommodation will be needed for the collection of prescription charges or a stamp machine could be installed as an alternative. The provision of a numbered ticket system for patient recall for collection of dispensed items is often desirable.

**Patients' waiting**

4.21 Ideally, the service counter should be located adjacent to the main out-patients waiting area, otherwise a separate sub-waiting area would be needed. If a waiting area is entered directly from a hospital street it will need to be partitioned off with doors in order to maintain the street's fire compartmentation. Bench or other seating should be supplemented by upright chairs for more elderly patients.

**Interview cubicle**

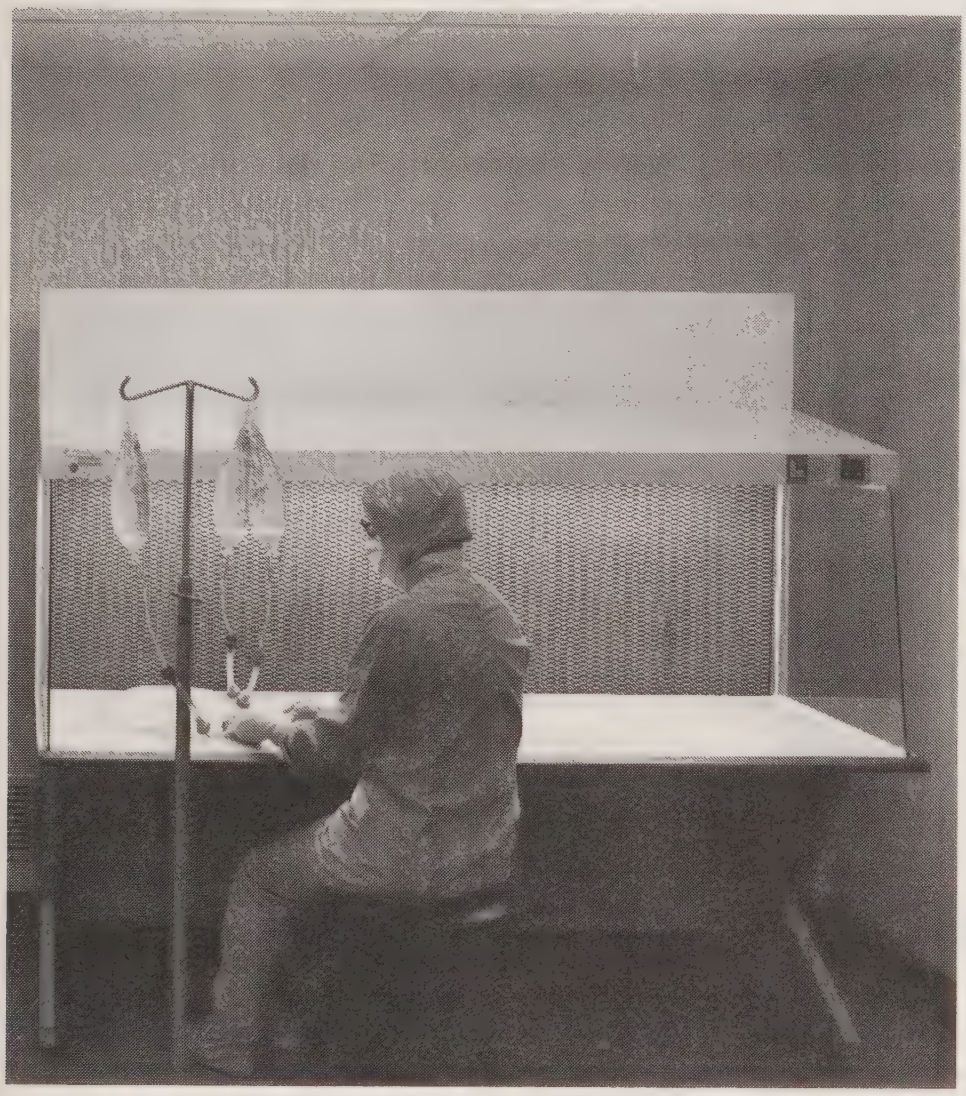
4.22 In addition to the counter-bays, an interview cubicle should be provided for private discussions between pharmacist and patient and if appropriate, for staff taking the patient's medication history. The cubicle should contain a counter or desk and chairs for the pharmacist, patient, and a relative accompanying the patient. Access should be from the dispensary and the waiting area. The cubicle should be suitable for use by wheelchair patients.

**Out-patients' dispensary**

4.23 If a separate dispensary is required because of the distance of the out-patients department from the main pharmacy, it should incorporate a service counter and provide facilities for breaking bulk dispensing operations. (4.10 and 4.12) A separate out-patients dispensary is, however, likely to stock a more limited range of products, eg fewer injectable medicines than one supplying wards as well. However, depending upon the type of clinic, a larger quantity of certain types of preparations may need to be stocked or prepared, eg those for the treatment of skin diseases. Where appropriate a direct and exclusive link with the main dispensary, eg a service lift, is advantageous for replenishing the unit's stocks.

**Sterile dispensing**

4.24 Some dispensed medicines need to be prepared as sterile products, either by sterilization in their final dispensed container or by aseptic preparation. This includes some antibiotic inhalations and sterile large volume injections which require additional ingredients specific to one patient. As the useful life of these preparations is often brief they are normally dispensed close to the point of issue to the patient.



Sterile dispensing of an intravenous nutrition fluid

4.25 A suite of rooms is required for these operations. Surface finishes, fire escape and environmental conditions should be of the same standard as for a sterile products manufacturing unit (5.31). The design of the suite should take into account whether or not an aseptic facility only will be required or whether products sterilized by heat are also to be prepared. Such facilities have been examined as a design study, the results of which are shown as an ergonomic drawing in Appendix 3.

**Small Sterile Dispensing Suite**

4.26 Where an aseptic facility only is required this would comprise an aseptic room, staff changing facilities, and a support room; all three rooms forming a suite. (Figure 4a).

4.27 Access for staff to the sterile suite should be via the changing room which also forms an airlock. Staff must follow a detailed wash and change routine, first removing outer clothing and shoes and storing them on the entry side of a step-over bench which marks the boundary between 'dirty' and 'clean' apparel. (A disposal point for used 'clean' clothing, masks, gloves etc should be provided on the 'dirty' side. Storage for the suite's own cleaning materials can be provided on the 'clean' side.) After stepping over the bench, staff put on special sterilized clothing and footwear already stored in the changing area. Once robed, washed and gloved, staff can then enter the aseptic room.

4.28 The aseptic room will include a contained workstation (with laminar flow) to Class 1 of BS 5295 to protect filling operations, such as filtering solutions and filling directly into clean pre-sterilized containers. As far as possible, there should be no ledges and little or no work surfaces apart from the workstation. Service requirements may include nitrogen gas to exclude air from certain products, vacuum, and fuel-gas/propane for sealing ampoules. Any non-fuel gases supplied must be filtered sterile and their cylinders kept outside the Clean Area and enclosed and isolated from continuously occupied areas.

4.29 Materials for use in the aseptic room, and products dispensed there, are passed into and out of the aseptic room from the support room by the use of separate pass-through cupboards. In the support room, a separate work surface can be associated with each cupboard for the preparation of articles for manipulation in the aseptic room, and for inspecting and labelling the final product. The support room would also store items for use in the suite. Special clothing is not required to be worn. The room will need to be pressurised to create a gradient of air pressure from the aseptic room to the dispensary, from which the support room can be entered. A speech panel or intercom will be required between the aseptic and support rooms.

4.30 The aseptic room and changing room require an air supply to Class 1 of BS 5295, with not less than 20 air changes per hour and a pressure gradient from there to outside the suite of 1.5 mm wg (monitored by manometers). The support room should be provided with air filtered to Class 2 of BS 5295, at a lower pressure than the aseptic room. These standards of air cleanliness should be achieved throughout the rooms when the suite is unmanned and maintained at the points where products are exposed or aseptic manipulations are being carried out when staff are working there. It may be convenient and economical to use the contained workstation as the source of filtered air to the room, in which case the workstation must draw its supply from outside the room.

**Large Sterile Dispensing Suite**

4.31 A facility where in addition to aseptic manipulation, dispensed materials can be prepared in a clean environment and terminally sterilized requires a larger suite. A typical design solution would comprise an entrance lobby,

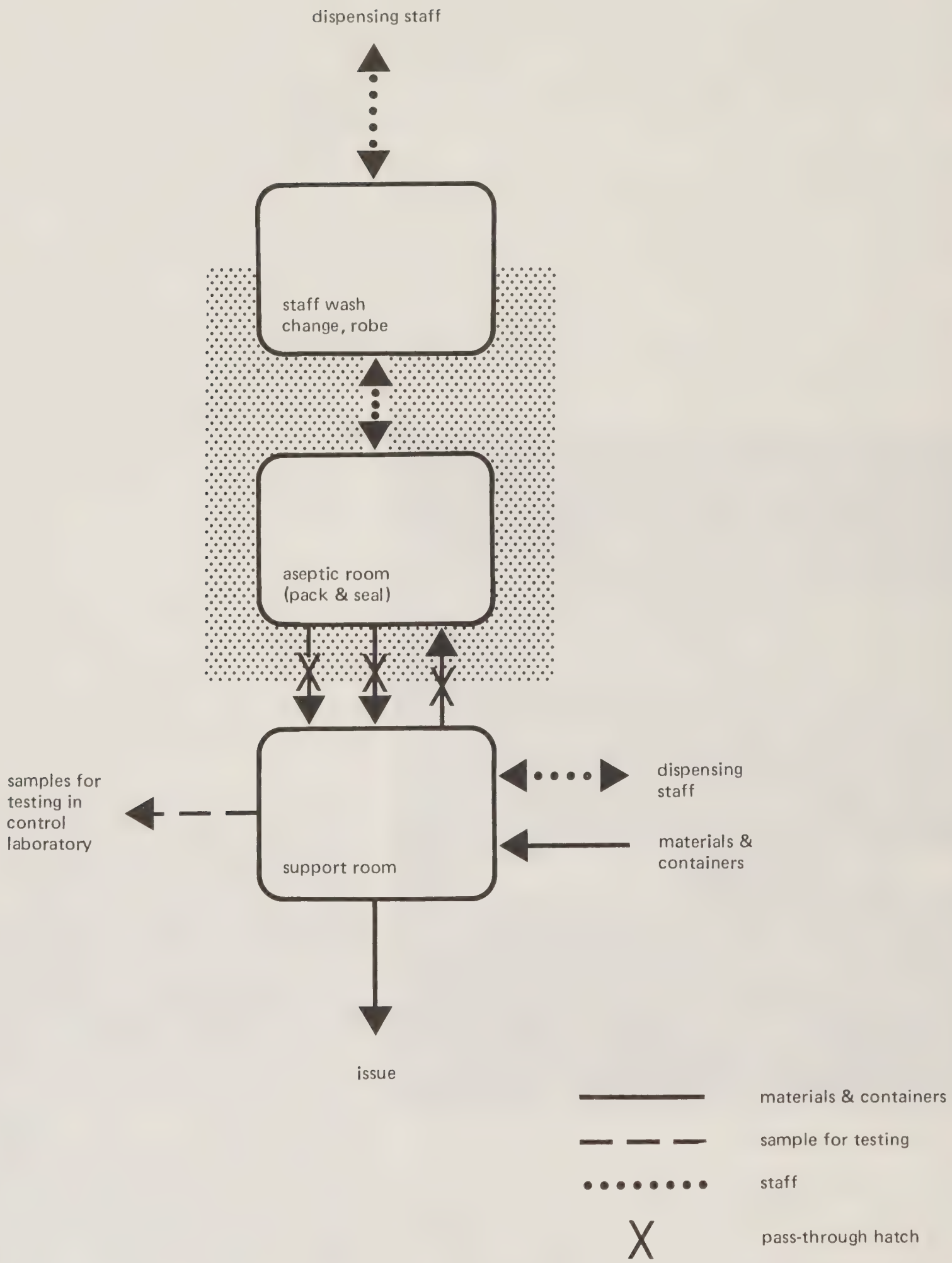



**FIGURE 4a Operation of small sterile dispensing suite**
(Clean Area within shaded portion)

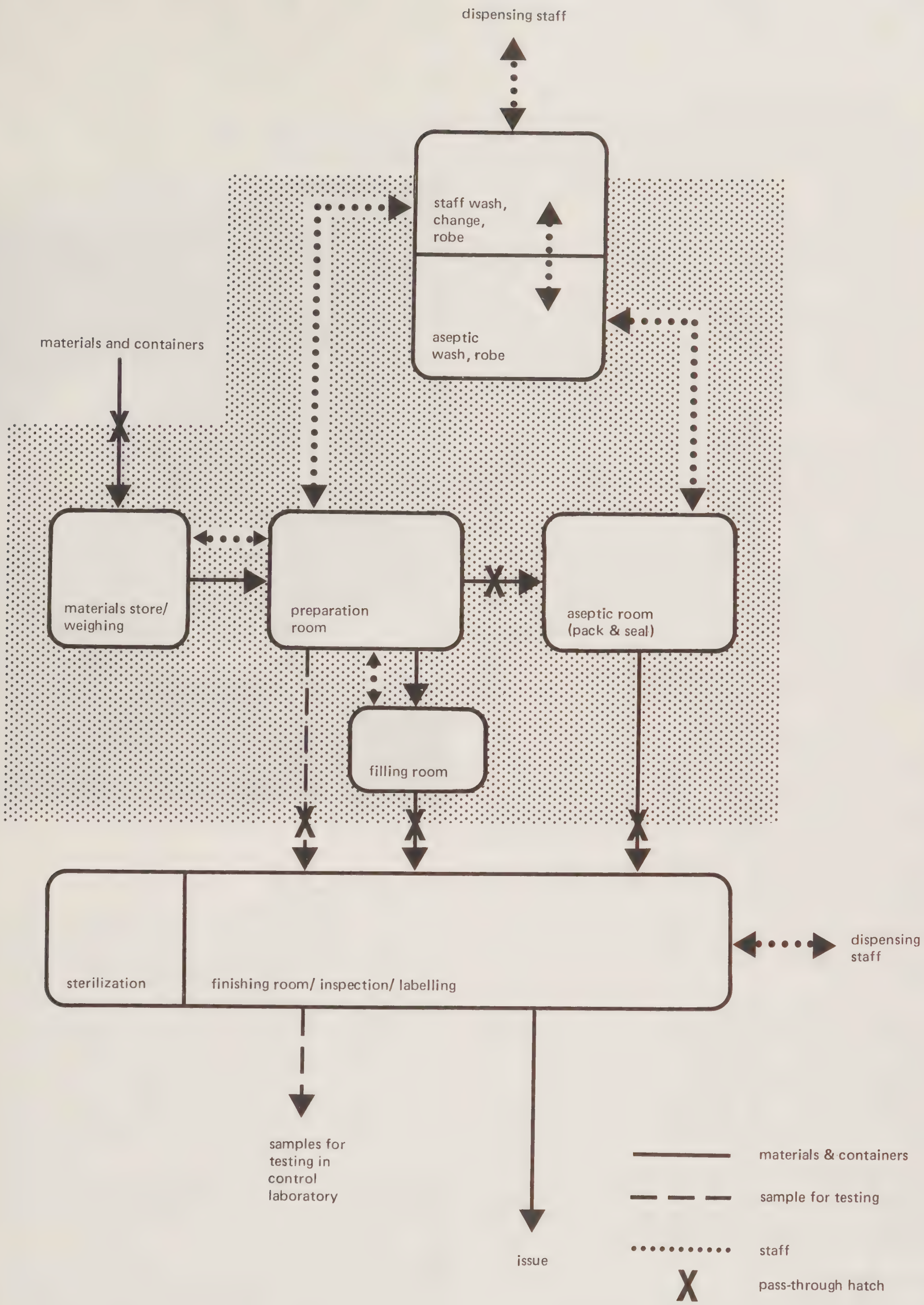



**FIGURE 4b Operation of large sterile dispensing suite**
(Clean Area within shaded portion)

two interconnecting change rooms, aseptic room, preparation room and associated filling area, clean area where weighing can also be performed and finishing room with sterilization equipment. (Figure 4b)

4.32 The lobby forms the combined entry to the suite for staff and materials. The staff would enter the first of the change rooms from here, whilst the materials would be passed into the sterile store via an interlocked pass-through cupboard.

4.33 Staff entering the suite via the lobby undergo a similar change procedure to that described in paragraph 4.27, except that they either don clean rather than sterilized clothing and enter the preparation room, or they enter the second change room (which forms the entry to the aseptic room) and robe in sterilized clothing there, with further washing before entering the aseptic room. It should not be possible for staff to go from preparation room to aseptic rooms except via the aseptic lobby.

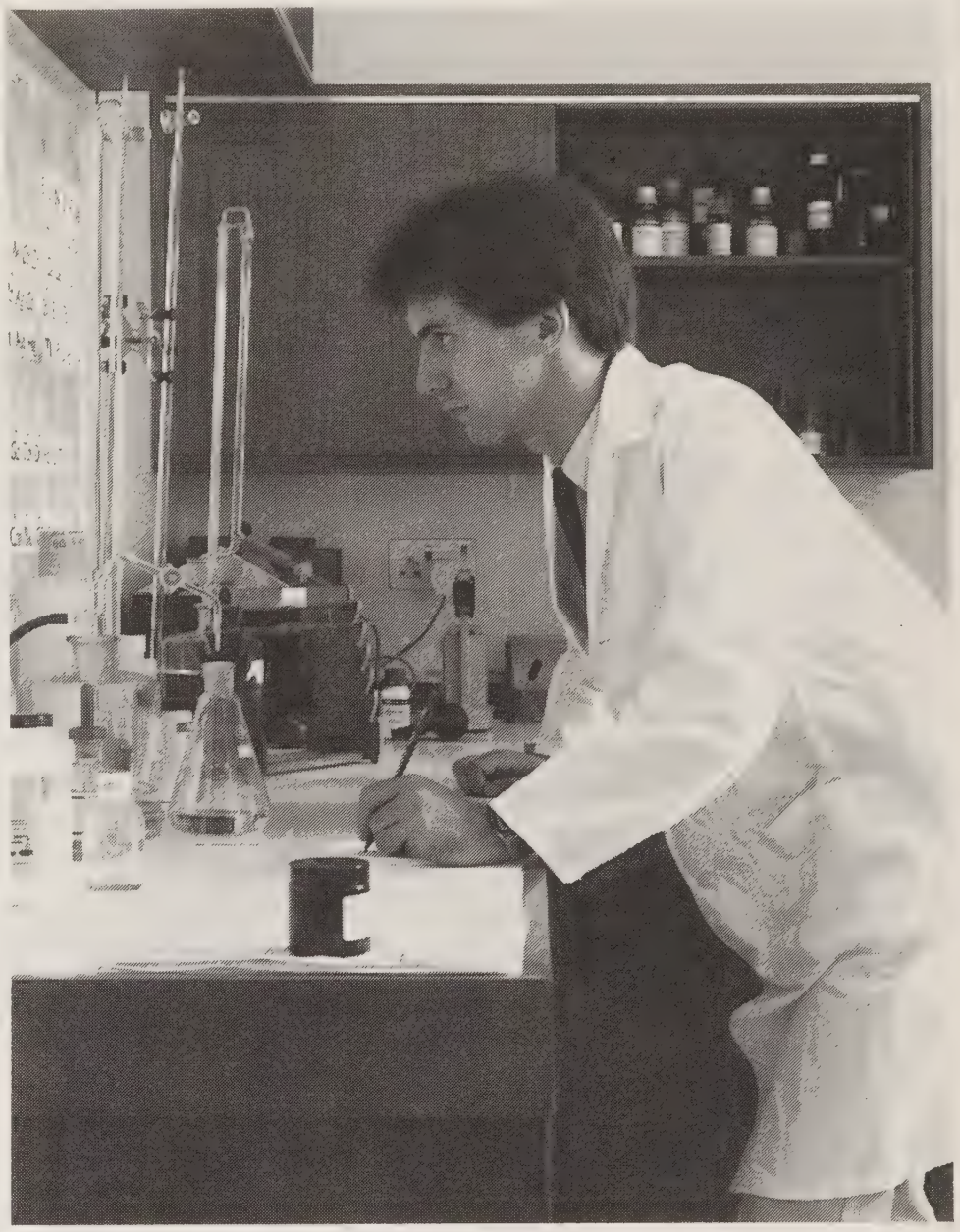
4.34 Materials for use within the suite, including sterilized water, are stored within the sterile store and any necessary weighing undertaken there. Cleaning materials reserved solely for the suite can be stored off the change facility. Mixing, dissolving and other preparatory manipulations are performed on the bench in the preparation room before the products are passed to the filling area or aseptic room for filling and sealing operations (under contained workstations). The filling area (for terminally sterilized products) can be continuous with the preparation room, but an interlocked pass-through cupboard is required to pass materials into the aseptic room.

4.35 Once filled and capped, or sealed, the products from the filling area are passed via a similar cupboard to the finishing room, where they undergo dry heat or steam sterilization. This room also contains facilities for inspecting and labelling the product. Aseptically prepared items are passed out of the aseptic room via a similar hatch to a separate work surface in the finishing room, for inspection and labelling only. Staff enter and leave the finishing room from the department's general circulation area, and not via the suite's change facilities. A small plant room may be required to house the sterilizers and other plant.

4.36 As with the smaller suite, the aseptic room would be supplied with air filtered to Class 1 of BS 5295, with not less than 20 air changes per hour. The filling area should be supplied with air filtered to Class 2 of BS 5295 at a higher pressure than its surroundings, but negative, relative to the aseptic room. Class 2 air should also be provided to the rest of the change facility and preparation room. Pressure differentials — particularly important for the aseptic room — should be monitored by manometers; it may be convenient to site these at the entrance to the suite so that the conditions can be checked prior to entry.

**Control Laboratory**

4.37 The in-process testing of some of the items dispensed in the sterile dispensing unit will require a small laboratory in the absence of pharmaceutical support quality control facilities. (5.14) The laboratory should provide maximum bench space for working and for instruments, together with a fume cupboard. All mains and other services requirements are detailed on the Activity Data sheets. (Chapter 10) Corrosive and flammable materials will require separate storage in leak and flame resistant bins or cupboards of approved design. The laboratory may also be suitable, with the addition of appropriate equipment, for pharmacokinetic investigations and simple identification tests on unknown medicines brought by patients.



Laboratory testing of a medicine

**Container cleansing**

4.38 Hospital pharmacies may consider the re-use (for non-sterile preparations) of glass medicine bottles after they have undergone a washing and drying process. Even where containers are not re-used there should be a facility for cleaning new containers. Ideally the equipment should be in a separate room but, wherever located, air extraction will be needed to cope with the steamy atmosphere. Specialised washing and drying equipment may be used in this room, eg special sinks with integral motorised bottle brushes or bottle washers using steam or hot water sprays. A sink waste disposal unit may also be required.

***Note:*** To minimise problems of microbial contamination, the hot water supply to the pharmacy department should not fall below 60°C (as measured leaving the tap).

**Ward service**

4.39 Local policy may decide that in the interests of staff efficiency the routine of ward servicing should utilise a 'picking' system for items such as pre-packs. One arrangement would be to select these items directly from the main pharmacy store, but speedier 'picking' can be achieved by establishing a separate holding area for such items. Wards would then be supplied with stock either

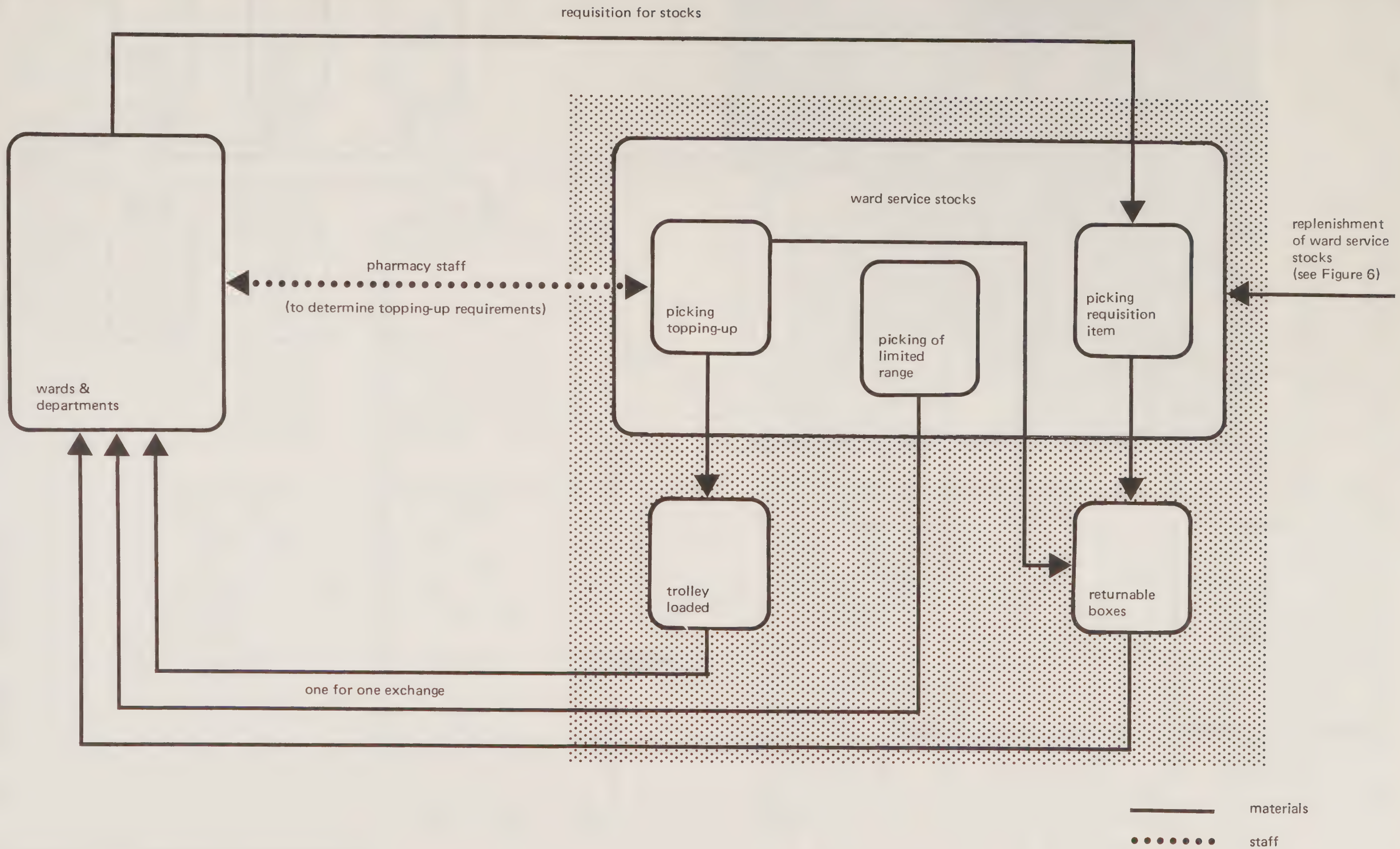



**FIGURE 5 Operation of ward service**
(Activities within the Pharmacy indicated by shaded area)

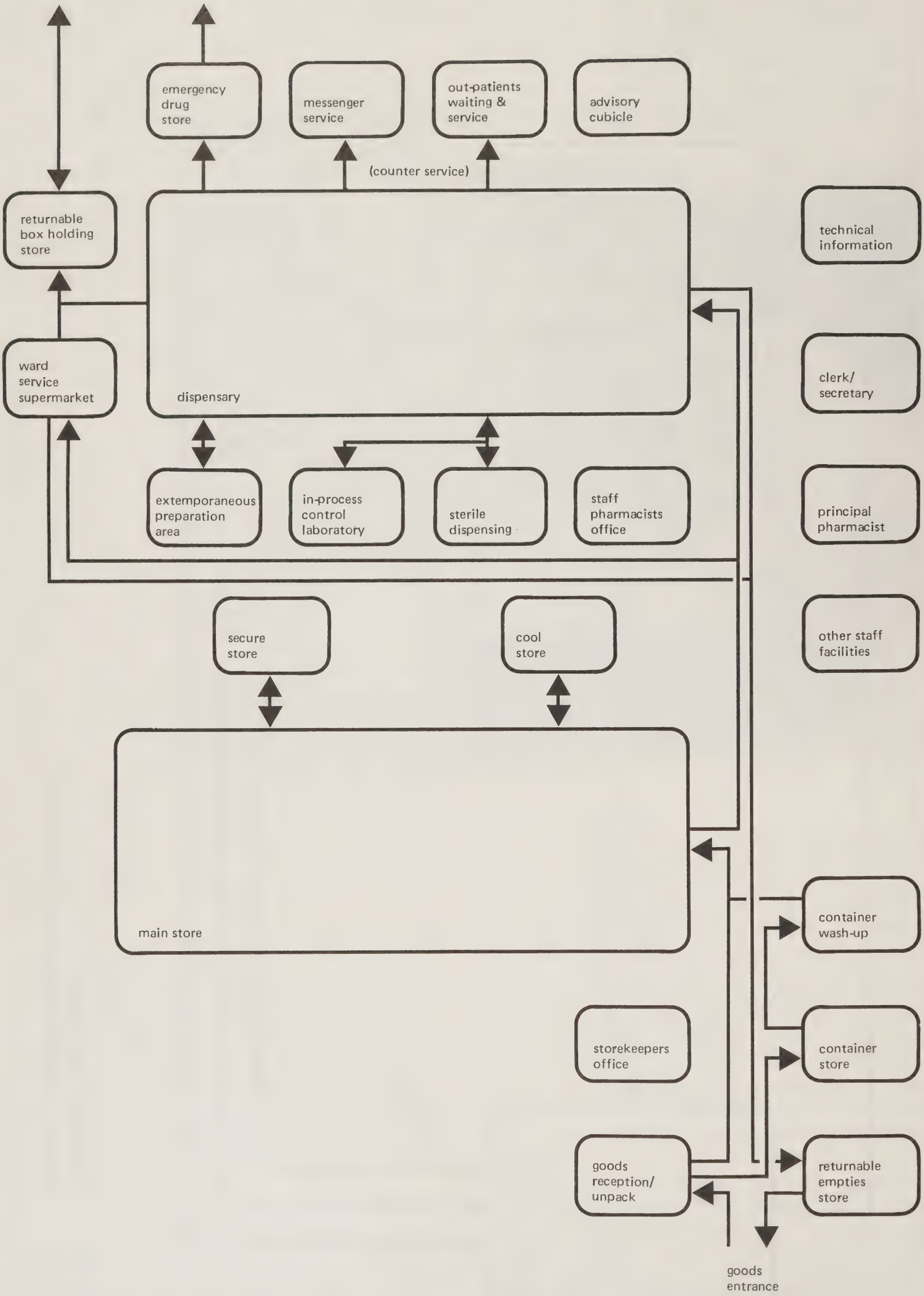
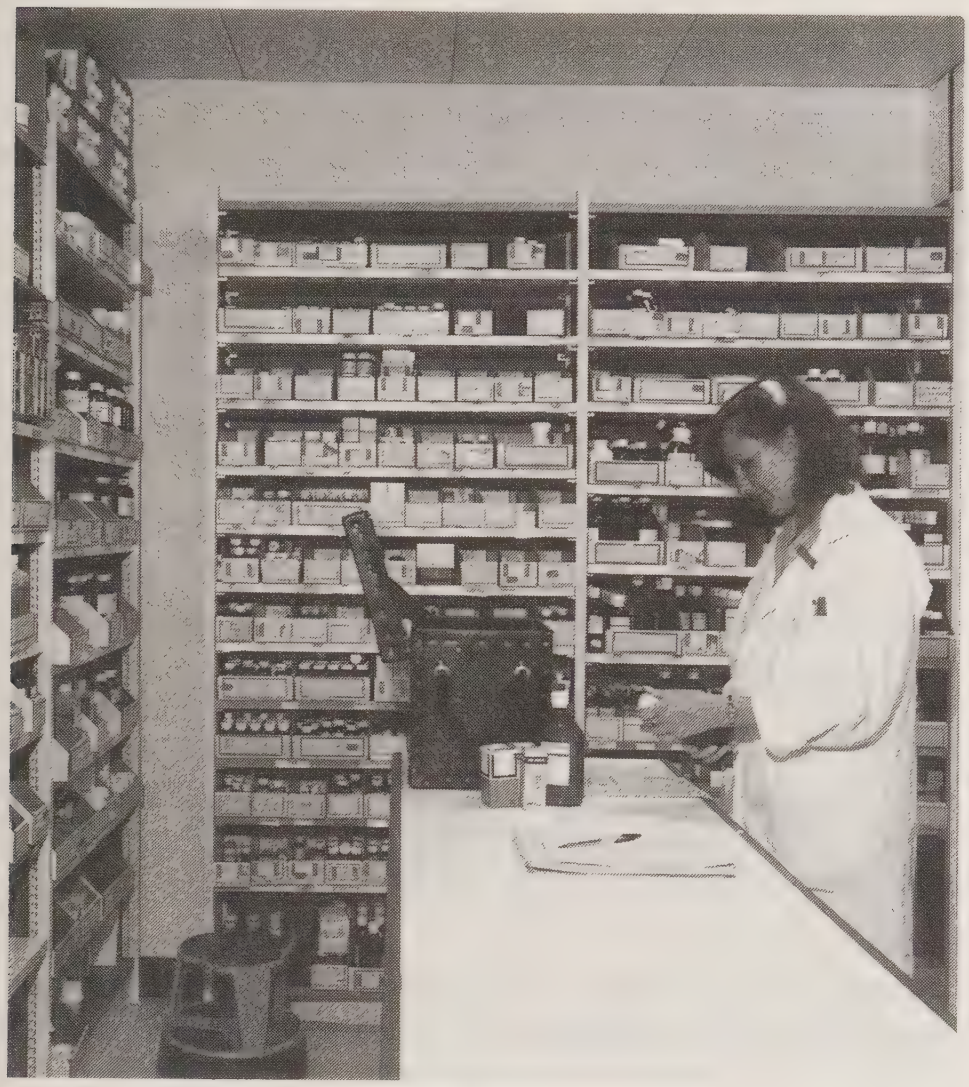



FIGURE 6 Intra - pharmacy relationships: flow of goods & materials

on the basis of requisitions or by a pharmacy operated 'topping up' service. With such a service the ward staffs' involvement in ordering medicines is reduced as the pharmacy staff check ward stocks against an agreed stock list and 'top up' the used items to the agreed levels. (Figure 5)



Ward service using prepacked medicines

4.40 A fuller exposition of 'ward supply' is given by Barnett in the "Text-book of Hospital Pharmacy" 1980. (see Bibliography)

4.41 If ward stock replenishment utilises a 'picking' system for items such as prepacks, this system could either supply these directly from stores, or from a separate facility for quicker issue to users. If a separate ward service area is provided, operational policies should aim to utilise these facilities fully, eg by spreading the workload throughout the day where possible. The area should be adjacent to the ward box holding store. It could also be used to supply community health clinics such as family planning clinics, but additional space would probably be required.

4.42 Circulation space between the wall-supported shelving and any free-standing island fixtures should be wide enough to allow two staff using supermarket-type baskets or trolleys to work abreast when necessary. Space for a refrigerator will also be required.

4.43 Controlled Drugs should not be kept in the ward service area, but should be supplied direct from the security store or dispensary for security reasons.

**Stores - general**

4.44 The stores section of the pharmacy provides facilities for keeping stocks of medicinal products in good condition after receipt from suppliers, and before being issued to other sections for onward distribution to wards, departments, clinics and patients. (Figure 6) However, the control of stocks in the stores is assisted by measures (procedural or physical or both) which limit access by dispensary staff to these stocks. The provision of storage facilities should take into account that:

a. a growing proportion of medicinal products need to be kept in temperature controlled conditions

b. more items are being dispensed in their original packs than from bulk stock

c. child-resistant and unit-of-use packs require proportionately more space than other packs.

4.45 As all goods in the stores would already have "passed for issue" status there would be no need for quarantine. In general, the storage conditions* should be cool (summmer maximum 25°C) and dry but certain groups of products require more stringent storage conditions in terms of temperature, security or protection from light. The need for rotation of stock and regular and thorough cleaning throughout all stores should be kept in mind.

4.46 The arrangements described in the following paragraphs refer to a pharmacy which is largely supplied on a daily basis from a support unit store holding larger stocks of items. However, certain pharmaceutical departments may not be so organised and because they will receive supplies from a number of sources - including goods reception and unpacking sections - at varying intervals, larger stocks of each item will need to be held. In these circumstances, each section of the stores will need to be larger.

4.47 Not all stores sections will necessarily be required. Local policy will decide, for example, whether or not the pharmaceutical department will issue dressings which do not attract a product licence and, although the pharmacist is responsible for the quality of medical gases, the cylinders may not always be stored and issued under his direct authority.

4.48 As the range of goods handled creates different storage requirements the stores area should be subdivided. Ideally, all sub-divisions should be grouped together to make use of common circulation spaces but for fire safety reasons the flammable store must be physically separated from other buildings. The medical gases cylinder store should be sited together with the main cylinder stores of the hospital and separate from the main building. The siting of the emergency store for out-of-hours supply is a matter for local decision.

4.49 Subject to whole-hospital policy, mechanical handling devices and trucks and trolleys may be used to move goods or transport them to and from the stores area. In view of the possibility of back injuries to staff involved in the handling of goods through stores, attention should be given to the provision of suitable trolleys and more specialist equipment such as drum handling apparatus. Reference should be made to relevant Departmental and other guidance on the handling of loads made under the Health and Safety at Work etc legislation. To allow such equipment to be used safely and efficiently all floors should be level without steps, but circumstances may

***defined in the European Pharmacopoeia**

necessitate using a gentle slope. If goods are to be delivered to or received from storage units on a different floor from the stores, a goods hoist adjacent to the stores area will be required, capable of taking a fully laden trolley or pallet.

**External goods entrance**

4.50 This Note assumes that facilities for the collection and delivery of goods to the hospital will be grouped to make the most economical use of such common facilities as a protected loading dock with tailboard access, and a goods reception area with vehicle parking and turning space. Part of this loading area, preferably with direct access to the pharmacy stores, should be reserved for pharmacy use, because the nature of goods handled makes it essential that pharmacy staff take immediate charge of their own deliveries on arrival. Some deliveries, eg infusion fluids, may require mechanical handling.

**Goods reception/unpacking area**

4.51 Although the goods reception stores of the hospital will normally be grouped, a separate area will be required for the reception and unpacking of pharmaceutical supplies and for packing of goods sent out to other hospitals. Incoming and outgoing goods should not pass through any other area. (Special arrangements should be made for out-of-hours receipt of drugs.)

4.52 The goods reception store should be adequately ventilated to minimise airborne dust produced when unwrapping parcels. Benches should be fitted at a comfortable working height, and space provided for holding parcels which cannot be unwrapped immediately on delivery. Unwrapping creates an accumulation of used packaging materials which will need regular disposal.

**Storekeeper's office**

4.53 A storekeeper's office should be provided at the pharmacy stores goods entrance to permit observation of the area. Facilities for processing paperwork and records will be required.

**Returnable empty containers store**

4.54 Unless it is local policy to use 'one-trip' containers, there will be a need for a space adjacent to the external goods entrance to hold returnable empty containers. Although containers are normally returned clean, the risk of contaminating other stored items can be avoided by segregating this space from the rest of the store.

**Specific storage requirements**

4.55 After unpacking and checking, goods are taken to the appropriate storage area. Different environmental conditions are needed for particular groups of medicinal products and there will be a need for separate areas, comprising general store, cool store, security store and flammable store. Storage space will be required for containers, and for medical gases and dressings if these are issued by the pharmacy.

4.56 The siting of the stores will depend on the hospital distribution policy. Bulkier items could be distributed to users directly from the stores, and other medicinal products made available through a ward service area or the dispensary. The dispensary's working stock of Controlled Drugs can be kept to the minimum by filling requisitions within the security store itself.

**General store**

4.57 A general store will be needed for a wide variety of products which do not require specialised environmental conditions. As pack dimensions vary considerably, adjustable shelving arranged in bays will be required. Adequate floor space should be allowed for the storage of bulky items such as infusion fluids and powder containers/drums which may be delivered or stored on pallets. Disinfectants and antiseptics should be isolated from other products.

**Temperature controlled storage**

4.58 A cool store of walk-in design will be needed for the growing proportion of medicinal products which have to be stored below ordinary room temperature. A level of 6-12°C (summer maximum 15°C) should be maintained by a refrigeration plant which must discharge its waste heat outside the main store. A chart recorder is recommended for continous temperature monitoring.

4.59 Refrigerators will be needed for storing specific items at temperatures between 2°C to 8°C.

4.60 Certain groups of vaccines, sera and other biological products need to be stored under deep freeze conditions (−15°C to 0°C); depending upon the stocks to be held, the freezer compartment of a refrigerator or a separate deep-freeze cabinet will be required.

**Security store**

4.61 Controlled Drugs and medicines which are liable to misuse (see HM(70)1 and HC(77)16) will need a special security store which is accessible only to authorised persons. The store should be designed as a strong-room. Space for racks or lockable cupboards and a bench for counting items and recording supplies and issues should be provided. An intruder alarm linked directly to a continually manned location (3.3) MUST be fitted, together with a system of external red lights to indicate that staff are working in the store.

**Container store**

4.62 A convenient area will be required for holding stocks of containers of various types and sizes. Empty glass and plastic bottles and caps and rubber closures should be stored away from paper and card containers and the cleaning arrangements should aim to limit the accumulation of dust.

**Dressings store**

4.63 If a dressings store is provided it should meet temperature and humidity requirements. The store should be sited near the goods reception area for distribution direct to wards, departments and clinics.

***Note:*** Certain dressings require a product licence under the Medicines Act because they contain medicaments. Since these medicated dressings should be stored and issued only under the control of a pharmacist they are categorised as medicinal products for the purposes of this Note and do not fall under the heading of 'dressings'.

**Flammable store**

4.64 Stocks of flammable materials should be kept away from user areas and the provision of an external isolated store for flammable materials is therefore essential. Local policy may require the pharmacy to be responsible for

holding stocks of flammable materials for other departments as well. Advice on the storage of flammable materials is contained in Health Technical Memorandum 83 "Fire Safety in Health Care Premises - General Fire Precautions".

**Medical gas cylinder store**

4.65 Even where piped supplies of frequently-used gases are available an external weatherproof store will be required for the range of gases that are supplied in cylinders. If local policy decides that this store should be under the control of the pharmacy department, access will still be required outside normal pharmacy hours. The code of practice for "Storage of Medical, Pathology and Industrial Gases Cylinders" - WKO(85)1 - gives guidance on the siting, design, construction and layout of medical gas and other cylinder stores and details specific storage requirements for cyclopropane and nitrous oxide/oxygen gas mixtures. Ergonomic data about handling medical gas cylinders is given in Appendix 3.

**Emergency drug store**

4.66 A store will be required for the supply of medicines when the pharmacy is closed. This store may be a lockable cupboard or small room and should include a refrigerator, and index system and a means of recording which item is taken. Access should not breach the security arrangements for the pharmacy or the rest of the hospital. Ideally, the store should be close to the pharmacy (for ease of checking and restocking), but security considerations may make it necessary to site the store near to the main thoroughfare of the hospital or near to an area which is constantly manned.

**Staff accommodation**

4.67 The requirements for staff accommodation in the pharmacy reflect the increased responsibilities and volume of work undertaken by the pharmaceutical services over the past 20 years. The relationship between staff accommodation and the rest of the department is illustrated in Figure 2.

**Offices***

4.68 An office will be required for the principal pharmacist. It should be sited near the dispensing section and be easily accessible for outside visitors. An adjacent office should be provided for clerical and secretarial staff, preferably within easy reach of the stores.

4.69 An office capable of accommodating two or more staff pharmacists will be required. It should be sited adjacent to the dispensary and be fitted with glazed observation panels. Each pharmacist will require space for a desk and a filing cabinet.

**Porter's room**

4.70 The porter's room or base should be close to the dispensing section and stores.

**Cleaner's room***

4.71 Provision will be required for the storage of cleaning materials and equipment.

**Staff changing and WC***

4.72 WC and hand-washing facilities should be provided for all staff within the department. Because of the type of materials handled by pharmacy staff they should be provided with changing accommodation comprising full-length lockers for the storage of clothing and personal items, within or adjacent to the pharmacy (depending upon whether or not suitable accommodation is available nearby). Where central staff changing facilities are used, cube lockers should be provided within the pharmacy for secure storage of personal items, together with a small stock of clean protective clothing for changing into if necessary during working hours.

**Staff room**

4.73 A staff room should be provided if no staff rest facilities are available nearby. Beverage making facilities will be required.

**Seminar room***

4.74 Seminar rooms are provided at various points in the hospital. If there is one near enough to the pharmacy it will be used; if not, it may be necessary for the staff room to be enlarged accordingly. When a drug information unit is located in the hospital, the seminar room will serve both. (4.87)

**Requirements for 1,200 beds**

4.75 Where more than 600 beds are to be served, the primary service facilities detailed in this chapter would be required, with certain sections enlarged to take account of extra staff and extra ward boxes. The dispensary, returnable box holding store, stores and staff accommodation in particular would be expected to grow, but the out-patient facilities and ward service area (4.41) may not need adaptation. The size of the sterile dispensing suite is dependent upon the nature of the products made there which, in turn, is likely to depend upon the medical specialties being served. However, it is more likely that a department serving 1,200 beds would require the large sterile dispensing suite (Figure 4b)

**Functional relationships with other hospital units**

4.76 Although it would appear to be more economical to concentrate primary pharmaceutical services into units serving several hospitals from one site, the service demands may still require certain local dispensing facilities, eg servicing out-patients (perhaps on a part-time basis) with associated additional transport and communication costs.

4.77 Where such additional dispensaries are not provided however, the units served by a central pharmacy would require the supply, on requisition, of pharmaceuticals in returnable boxes. Some visiting ward pharmacist and top-up services are also increasingly being provided.

**Visiting pharmacist's base**

4.78 Where a visiting ward pharmacist service is provided for a dependent hospital without its own pharmacy or separate dispensary, there may be a need to provide a base for the visiting pharmacist(s).

## DRUG INFORMATION SERVICES

4.79 The activities of drug information services are essentially linked to patient care and, as such, are viewed in close relationship to primary pharmaceutical services. This section enlarges upon the functional requirements

***For more informatioin on these spaces refer to the 'Common Activity Spaces' Health Building Note 40, Volume 1.**

of such services at both individual hospital level and at the level of a specialised unit, each in their own way supporting the work of the primary service pharmacists.

**Hospital level services**

4.80 A technical information room, sited close to the dispensary section, will be required for the ward pharmacy service and also for medical and nursing staff who may wish to consult reference material maintained by the pharmaceutical staff.

**District centre**

4.81 At district level (or other grouping of facilities akin to a Noel Hall pharmaceutical area), the activities undertaken by a specialised drug information centre would embrace those at individual hospital level. The centre would, in addition, undertake more detailed, literature-based research on queries referred to it, both from the hospital the 'centre' is situated within and from associated hospitals. Other services provided could include a wider dissemination of information to individuals and groups of health professionals and to drug and therapeutic committees. The normal location of such centres would, therefore, be in the largest acute or teaching hospital of the district/area.

4.82 Accessibility to the various interests served is a major factor in planning centres; location within an industrial zone, for instance, would hardly be suitable. Siting adjacent to, or within, the pharmacy department of a large hospital would allow close liaison with the visiting ward pharmacists and other clinical staff. Alternatively, there may be merit in choosing some busy part of the hospital eg off the main street. Where a centre is to fulfil a regional role, other siting options may be considered.

4.83 Similarly, the equipment required by each centre would vary depending upon operational policies and nature of the workload. For the purpose of this Note, it is envisaged that district drug information centres would be able to call upon the support of regional centres; the latter will therefore require more complex equipment and more extensive facilities, particularly secretarial. The provision described here is for a district support centre although, where appropriate, an indication is given of the requirements of a regional centre.

4.84 Essentially the centre comprises a main read/work area with ancillary facilities. Office accommodation should be set aside for the receipt, cataloguing and preparation of abstracts of a range of periodicals as they arrive. Journals and reference books would be displayed in the main area of the centre on library fittings which should allow for the storage of at least one year's issues of each journal (with older editions of books and journals remaining accessible in a nearby room).

4.85 Individual desks for study would be required, with some in cubicles or a separate room for quiet work. If microfilm storage of information is used, there would need to be suitable provision for reading and facisimile production.

4.86 Separate office accommodation is required for the pharmacist in charge. It can be combined with an interview room for discussions with other health professional staff about a particular patient's medication problems. There should be a reception desk in the main area for written or telephone enquiries. If secretarial staff are employed they must have suitable facilities. Reprographic and lithographic equipment (if used) may be noisy and thus call for separate accommodation. Storage space for stationery will be required.

4.87 The information centre may additionally provide educational facilities for pharmacy and other staff groups and thus an adjacent seminar room would be required. (4.74) A regional centre would be expected to make more intensive use of a seminar room and consideration should, therefore, be given to providing this facility for the exclusive use of the centre.

**Communications and other facilities**

4.88 Good communication facilities are essential; these would include direct lines to the public telephone network in addition to the hospital switch-board. Facilities for connecting a terminal to a distant data base computer may be required.

4.89 Depending upon local policy, the centre may use computer facilities for filing, searching, processing and retrieving information. The noise generated by such equipment should be considered when determining its location.

# 5 Functional Requirements for Pharmaceutical Support Services

5.1 This chapter enlarges upon the objectives, functional requirements and design implications of the principles described in Chapter 2 for pharmaceutical support services of a more industrial nature, eg manufacturing, quality control, and purchase and distribution. Full details of activities, equipment, environmental conditions, finishes of walls, floors and ceilings are given in the Activity Data sheets listed in Chapter 10, although certain points of major importance are also discussed in this chapter.

5.2 Before a decision to provide manufacturing facilities is made, the Department's policy on such provision must be considered carefully. (2.1-2.11 and Appendix 2)

**Support services relationships**

5.3 Although some saving of accommodation may be possible if support units are adjacent to primary service departments, it is more likely that the industrial nature of the support services will dictate that the latter are positioned in a peripheral zone of the hospital site. (Different criteria apply to the drug information service and radiopharmaceutical preparation which are dealt with in Chapters 4 and 6 respectively.)

5.4 Figure 7 shows the flow of pharmaceutical materials between the support services and the primary services department. Manufacturing support services - sterile, non-sterile or assembly - have many common features, such as standard of finishes and engineering requirements, and thus are likely to be found located together; this allows for some sharing of accommodation between the functions. Because of the close connection between quality control functions and manufacturing, it is useful to incorporate quality control laboratories within a manufacturing unit; this could effect a more speedy flow of test results and so reduce quarantine storage needs. Although not of a manufacturing nature, a purchase and distribution unit linked to a conjunct manufacturing unit could yield savings in storing and handling the products of the manufacturing unit, particularly bulk fluids. Figure 8 gives an analysis of accommodation that could be shared.

5.5 The need for economy of design (7.8-7.10), standard of finishes etc is equally applicable here. Those parts of the premises which are concerned with manufacture must satisfy the provisions of the "Guide to Good Pharmaceutical Manufacturing Practice" and additional requirements of the Medicines Act 1968. For this purpose medicinal products can be divided into sterile and non-sterile, depending upon their intended use. The standards for premises show differences between the two forms of manufacturing, although even within each one there is not complete uniformity, eg if certain creams are to be handled in the non-sterile unit or aseptically-prepared products in the sterile unit. However, the provision of facilities of a uniformly high standard will give greater flexibility of use if the manufacturing areas are combined.

5.6 Where facilities are combined to form a conjoint unit the need for good internal communications and flexible provision of accommodation, together with the ability to expand, are of paramount importance. These factors should be borne in mind at the early stages of planning.

**Common features of manufacturing services**

5.7 This section describes common features of the manufacturing processes for sterile and non-sterile manufacturing and controls outlined in the "Guide to Good Pharmaceutical Manufacturing Practice".

## MANUFACTURING STORES

5.8 Both forms of manufacturing units require similar stores provision; this includes quarantine storage for incoming raw materials and for finished products. (Figure 9) Quarantine is a method of holding a batch of materials in store whilst awaiting the results of quality control testing; the materials being issued for use if acceptable or destroyed or reprocessed if unacceptable. A goods reception/unpacking area and storekeeper's room will be needed.

5.9 Depending on the local arrangements for deliveries, some raw materials would be held in quarantine until passed for use in production; they then would be transferred into a materials store until required. Storage will also be needed for other materials involved in manufacturing, eg small quantities of production consumables like filters and cleaning materials. Empty containers need a great deal of space. Clean containers are held separately from those awaiting cleaning, eg returns for re-use (see Figure 10); sorting and disposal of rejected returned containers should be performed away from other activities. Consideration should be given to the separate quarantining of containers.

5.10 Secure label storage, such as lockable cupboards, will be required, with restricted access. The number of labels issued for each batch of a product is strictly controlled, with counting before and after use; only after this kind of audit can any unused labels be destroyed. Storage arrangements should ensure that the risk of label mix-up is minimised. If a label printing facility is being provided it should be associated with this storage.

5.11 After manufacture, the product undergoes testing for quality control purposes before being released or rejected. During this time it must remain in a quarantine area for a period; sterile products may be held for up to

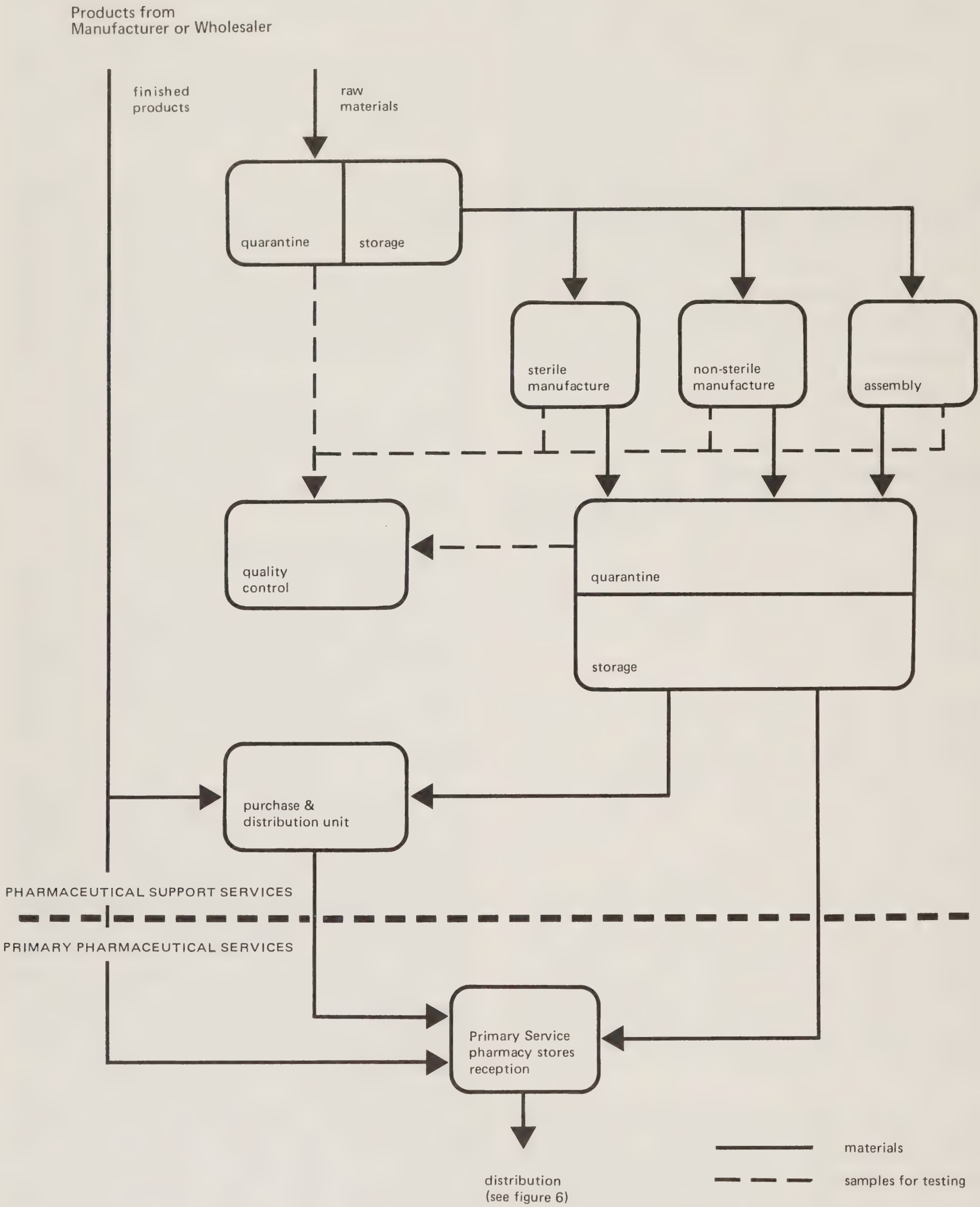



**FIGURE 7** Flow of pharmaceutical materials & products between support service units & primary service departments

| ACTIVITY SPACE | SUPPORT SERVICE | | | | |
|---|---|---|---|---|---|
| | STERILE MANUFACTURE | NON-STERILE MANUFACTURE | ASSEMBLY | PURCHASE & DISTRIBUTION | QUALITY CONTROL |
| PREPARATION | | | | | |
| STILL ROOM | ■ | ■ | | | |
| INGREDIENT WEIGHING | ■ | ■ | | | |
| CONTAINER PREPARATION | ■ | ■ | ■ | | |
| FINISHING | | | | | |
| INSPECT / LABEL | ■ | ■ | ■ | | |
| EQUIP. CLEANSING & STORAGE | | ■ | ■ | | |
| IN-PROCESS CONTROL | | | | | |
| LABORATORY | ■ | ■ | | | ■ |
| STORAGE | | | | | |
| GOODS REC./UNPACK/DESP. | ■ | ■ | ■ | ■ | |
| STOREKEEPERS ROOM | ■ | ■ | ■ | ■ | |
| MATERIALS | ■ | ■ | | | |
| QUARANTINE | ■ | ■ | | | |
| FINISHED PRODUCTS | ■ | ■ | ■ | | |
| CONTAINERS | ■ | ■ | ■ | ■ | |
| RETURNABLE EMPTIES | | ■ | ■ | ■ | |
| FLAMMABLES | | ■ | ■ | | ■ |
| STAFF ACCOMMODATION | | | | | |
| W.C./CLOAKS (M&F) | ■ | ■ | ■ | ■ | ■ |
| ENTRANCE LOBBY | ■ | ■ | ■ | | |
| REST ROOM | ■ | ■ | ■ | ■ | ■ |
| PORTERS ROOM/BASE | ■ | | | ■ | |
| CLEANERS ROOM | ■ | ■ | ■ | ■ | ■ |
| PHARMACISTS OFFICE | ■ | ■ | ■ | ■ | ■ |
| COMPUTER | | | | | |
| as required present/future | | | | ■ | ■ |

**FIGURE 8 Support services**
**Activity spaces common to two or more support service units**

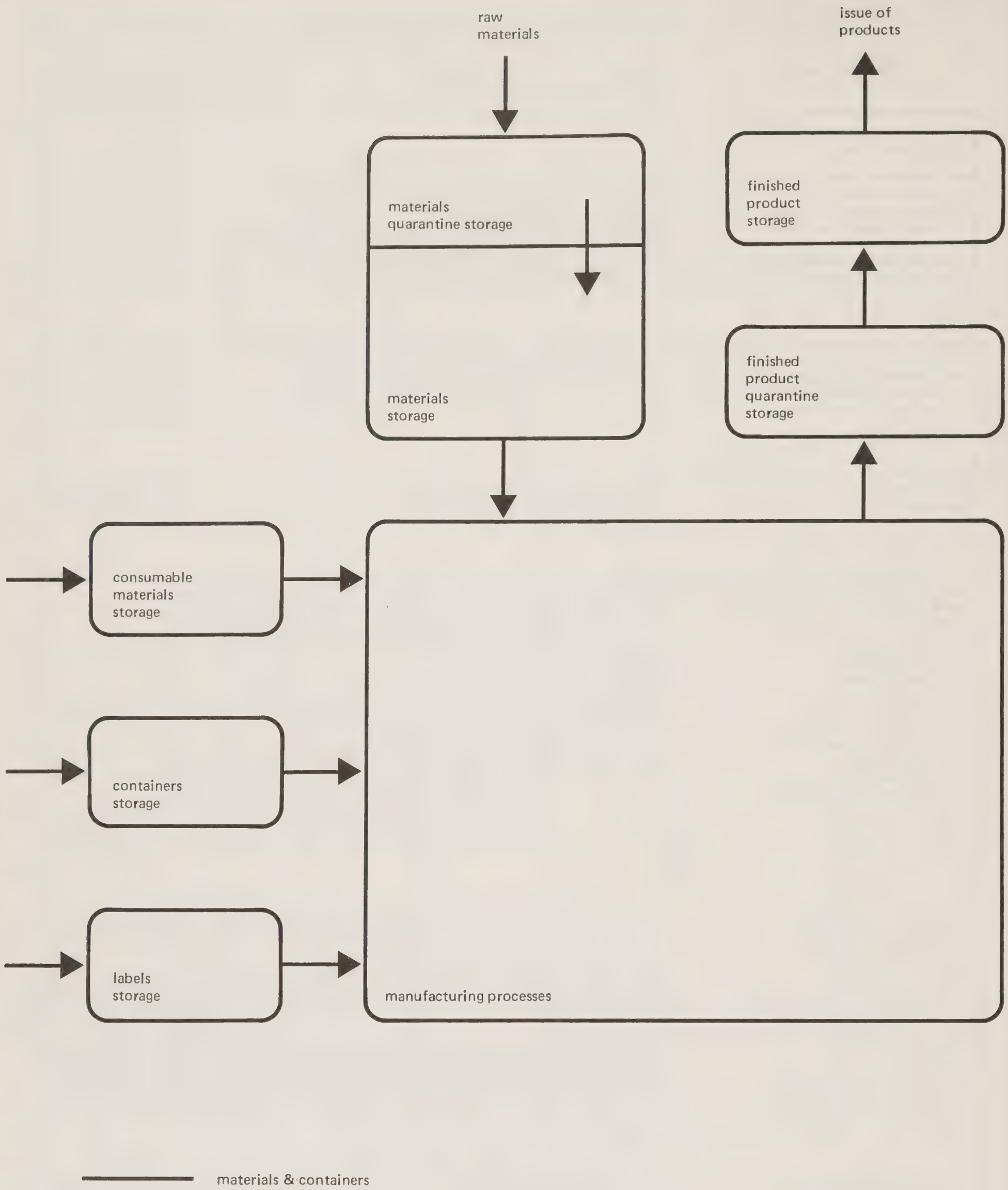
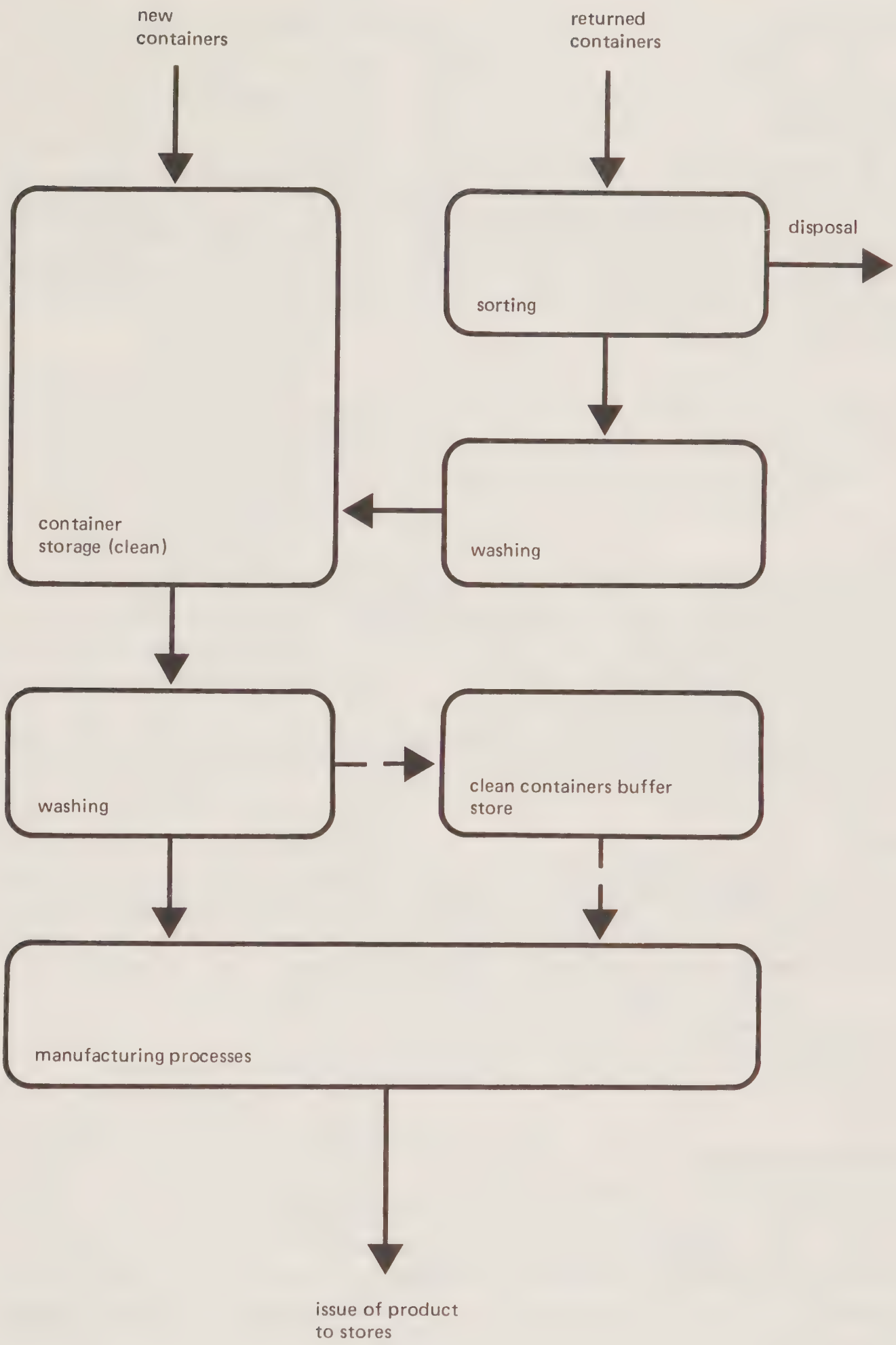



FIGURE 9 Storage facilities connected with manufacturing units




optional route

**FIGURE 10 Container storage in connection with non - sterile manufacturing units**

four weeks. Thus, the space needed for holding products will vary according to the unit's capacity and product mix. On release, the items are passed to the finished products store. It may not be necessary to totally segregate quarantined storage from finished products. The use of, for instance, movable screens will assist flexibility in storage arrangements.

5.12 The general environmental conditions for storage are similar to other pharmacy stores, and refrigerators may be required for batches of small items in the materials store and finished product stores; within such refrigerators a defined area for quarantined goods may be provided if required. The use of pallets and fork lift equipment could allow for storage on racks to a height above that of a normal hospital ceiling. Any bulk flammable materials must be kept in a flammable store away from the main building. Tanks may be worth considering for the storage of bulk industrial methylated spirit.

5.13 While it may be convenient to hold stocks of frequently-used items in close proximity to the manufacturing areas, these stocks should be kept away from raw materials and finished products. This facilitates cleaning and reduces cross-contamination risks.

**Quality control**

5.14 Sampling for quality control takes place at a number of points in the manufacturing process, eg sampling subsequent to sterilization. Although many of the tests may be performed off site, this is not the case for the in-process testing noted in paragraph 5.23. Thus, if there is not a quality control support unit adjacent, a small area outside the suite should be set aside for this purpose; a laboratory as described in paragraph 4.37 should suffice.

**Documentation**

5.15 Documentation is an important aspect of quality assurance for products and copies of standard documents are required for each batch. The master document should be stored under the control of the pharmacist in charge of production, for whom office accommodation will be required. The batch records will need to be filled in by staff at many stages in the manufacturing process, such as weighing (5.20), and appropriate facilities should be provided.

## STERILE MANUFACTURING

5.16 This facility is primarily for the batch production of sterile medicinal products not generally available from commercial sources, such as special formulations of transfusion or topical fluids, small volume eye drops, or injections (see Appendix II for Departmental guidance). The majority of the products so manufactured are terminally sterilized, ie after sealing into final containers, although some products are damaged by heat and need to be filled aseptically into sterilized containers.

5.17 Although most of the sterile unit's work relates to liquid preparations, solid products may also be processed and this is taken account of in the descriptions which follow. In planning the unit the project team should take into account the range of products to be manufactured; the range of sterilizing equipment to be used, which will determine the total output (which could include sterilized antiseptics); and the need to follow the guidelines set out in the "Guide to Good Pharmaceutical Manufacturing Practice", in particular for control of microbiological and particulate contamination. Sterile manufacturing should therefore be sited away from areas of potential contamination such as laundry or refuse disposal.

**Layout**

5.18 Figure 11 illustrates the workflow through a sterile manufacturing unit and Figure 12 gives the required room relationships. From both figures it is clear that the unit is comprised of a Clean Area with entrances and exits carefully defined and controlled with ancillary accommodation adjacent. Some of these ancillary rooms are required for early stages and others for later stages in production. The Clean Area requires mechanical ventilation (5.32-5.34) and a high level of internal finishes. There are special requirements for the preparation of distilled water. (5.35)

5.19 The rooms within the Clean Area comprise preparation and filling rooms and aseptic room(s) together with changing accommodation for staff. Ancillary accommodation required is for container preparation and ingredient weighing on one side, and sterilization, inspection and labelling, and storage on the other (Figure 13). Quality control accommodation will also be required. Verbal communication and visual supervision between the Clean Area and the ancillary accommodation is essential. Storage space will also be required for a range of small equipment and materials, such as filter membranes.

**Ingredient weighing**

5.20 Raw materials taken from stores are weighed in the weighing room before being passed directly into the preparation room of the suite via an interlocked pass-through cupboard. The weighing room should be fitted with enclosed balances set up on a level (slate) table with a completely firm base. There will also need to be provision for recording the weighings in batch documentation.

**Container preparation**

5.21 Containers from the stores which need washing should be unpacked before being processed in the container preparation room; the clean containers and closures should be handled only within a Class 2 environment. Immediately prior to manufacture all containers are washed in a washing machine, with a final rinse in filtered apyrogenic distilled water before passing directly to the filling area; a combined rinse/conveyor system may be used. Belt conveyors should not run between dirty and clean areas but should stop at the entry to the Clean Area, bottles then moving forward across a static plate. Closures may also be prepared in this room and transferred to the filling area. A larger interlocked pass-through hatch into the preparation room, capable of taking the movable tanks used inside the suite, may be of value here, with a folding shelf for transferring the smaller items such as pails of closures.

5.22 The ventilation system may have to cope with high temperatures and humidity in this room, where cleaning of container closures can also take place.

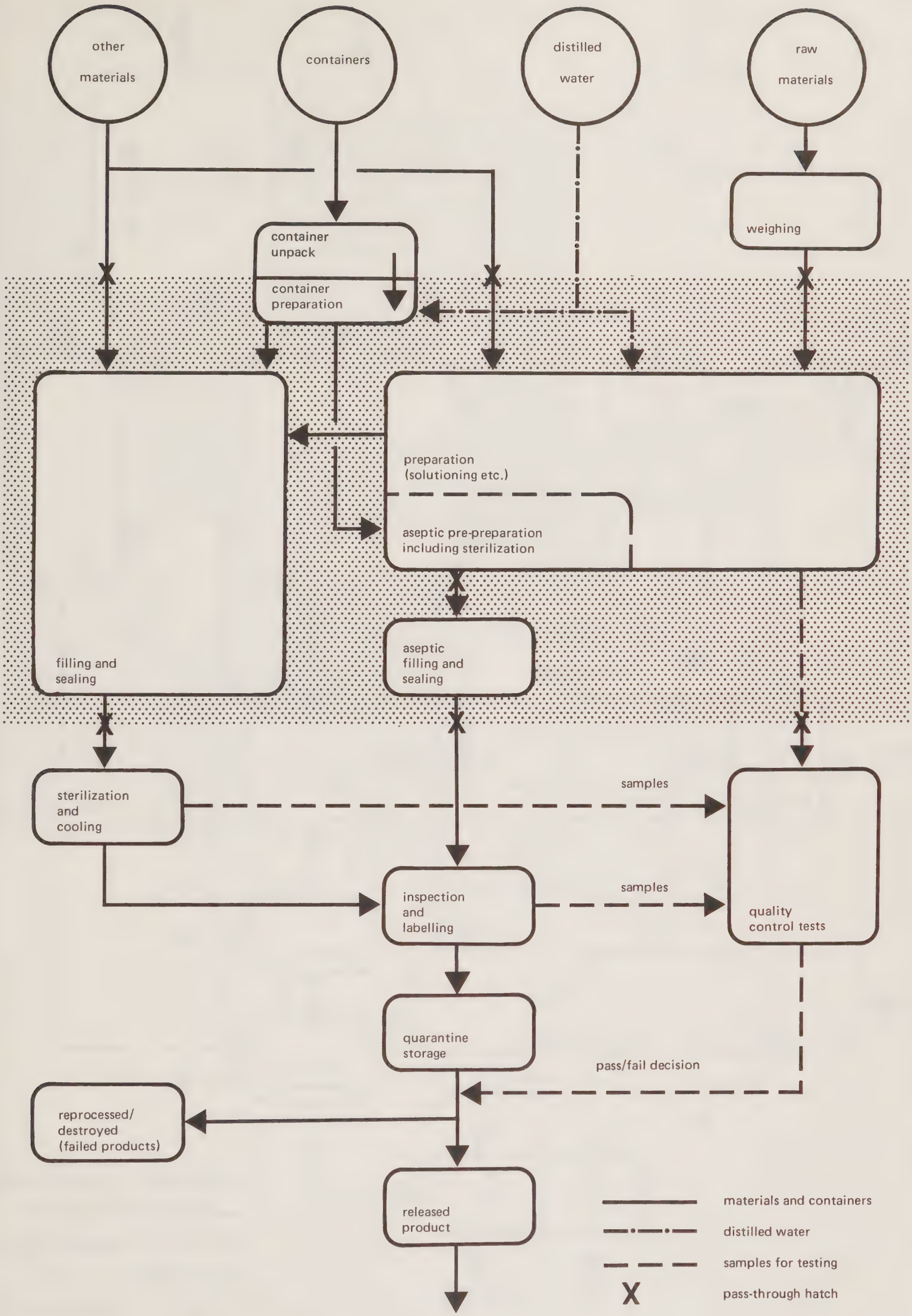



**FIGURE 11 The workflow through a sterile manufacturing unit**
(Clean Area within shaded portion)

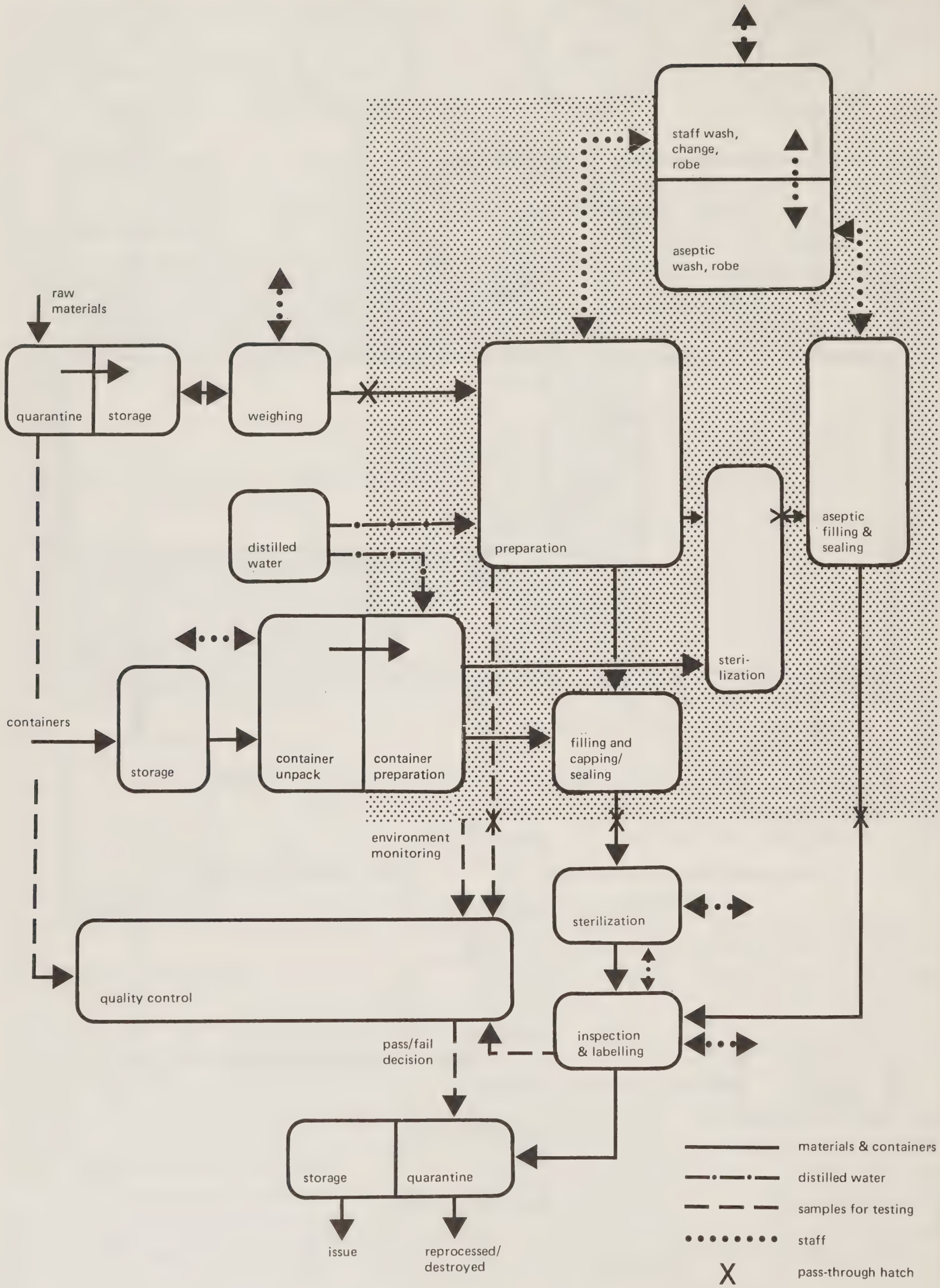



**FIGURE 12 Operation of sterile manufacture**
(Clean Area within shaded portion)

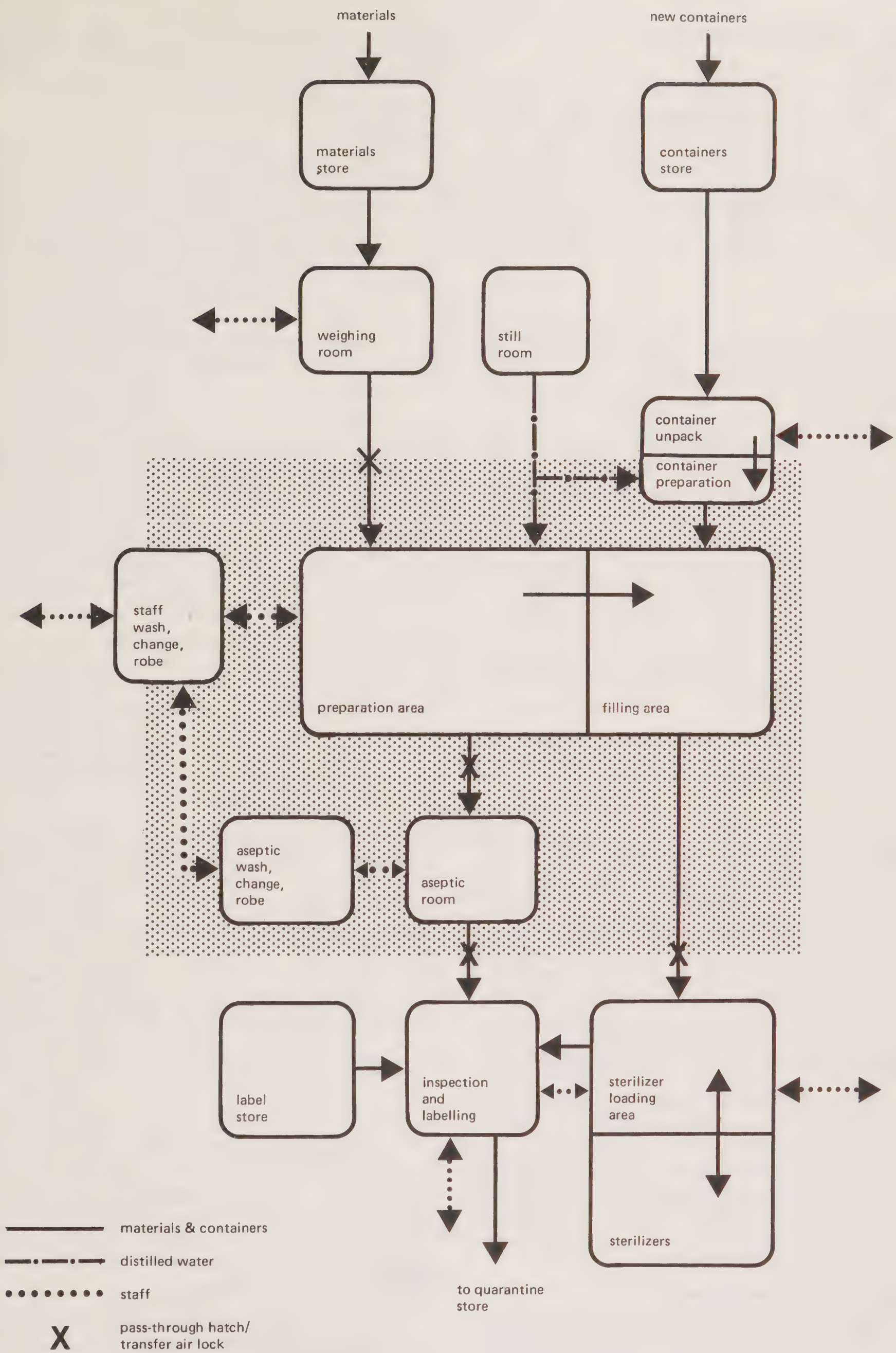



**FIGURE 13 Ancillary accommodation connected with a sterile manufacturing unit**
(Clean Area within shaded portion)

## Operations within the Clean Area

### Preparation

5.23 For terminally sterilized products, solutions are prepared in the preparation room using apyrogenic distilled water and the materials pass in from the weighing room. The solutions are often prepared in mobile tanks with additional mechanical mixing. A sample is taken at this stage for a simple in-process test to confirm that it is of the required concentration. The tank is then moved to the filling room or the solution is pumped there. (Figure 14)

### Filling

5.24 In the filling area for terminally sterilized products, the solution is forced through a clarifying filter and filled into containers which are then capped (bottles) or sealed (bags and ampoules) using heat or radio-frequency welding equipment where appropriate. There is an alternative method whereby a single machine blow-moulds plastic containers, fills and seals them. The filling zone for large-volume injections (intravenous solutions) needs protecting by a contained workstation; it would be advantageous if this workstation was capable of being switched on prior to use either from outside the room or by a timing device. The filled containers are passed to a collection point in the sterilizer loading area either manually, by means of sterilizer baskets, loading trucks and transfer trolleys via a transfer air lock, or by mechanical conveyor which should not run beyond the boundary of the clean and/or the external area. (Figure 15)

5.25 The requirements for the filling of containers with products hazardous to the operator (such as cytotoxic agents) are described in 4.18.

### Aseptic filling

5.26 Aseptic products are filled in the aseptic room. The containers used should be washed with distilled water and then sterilized ready for filling. This sterilization may take place in a bay of the preparation room devoted solely to the preparation of materials subject to aseptic handling and manipulation. This bay would also form the entrance to the aseptic room(s) for materials via an interlocked pass-through cupboard. It may lead into a lobby to the aseptic room(s) which could also serve as a holding store for sterilized equipment and utensils, as no material should be stored within the aseptic room itself. (Figure 16)

5.27 Aseptic manipulations undertaken in the aseptic room would need to be performed inside a contained workstation. Appropriate service requirements may include gas, medical compressed air, nitrogen and medical vacuum; non-fuel gases should pass through a sterilizing filter. The finished products are passed directly to the inspection and labelling area outside the suite, via an interlocked pass-through cupboard.

### Personnel exits and entrances

5.28 Staff enter and leave the Clean Area via a changing room in which outer garments and footwear are removed on the entry side of step-over bench. They then undertake a change/wash/robe procedure before entering the preparation room and from there the filling room. The aseptic room must be approached through an additional aseptic changing room, as there is no direct link for personnel between the preparation and aseptic rooms. This changing room may lead into a lobby acting as a small sterile store for the aseptic room(s). Normal exit from the suite is only permissible by retracing the same route.

### Cleaning

5.29 Mobile tanks, and other small items of equipment should be cleaned and stored in the Clean Area and a wash bay should be provided off the preparation room for this purpose (Figure 17), with a floor drainage channel which discharges to a drain outside the Clean Area. Facilities for steam cleaning may be considered. A stainless steel sink with elbow operated wall-mounted taps should also be provided for cleaning other items of equipment. A copper waste pipe is recommended and if possible the trap should be outside the Clean Area for ease of maintenance.

5.30 Cleaning facilities for the Clean Area need to be separate from those outside. Thus, the 'clean' cleaners' utensils for use within the Clean Area should be stored in the staff change/robing area, while a separate cleaner's room would be required for servicing the other parts of the unit. If the unit also launders its own clothing, either by washing or dry cleaning, a separate room will be needed for this purpose, although project teams should consider the use of contract services.

### Clean Area construction and finishes

5.31 The whole fabric should be smooth, impervious, easily cleaned and able to withstand the repeated application of disinfectants. Construction and fitments should be such that there are no ledges where dust can collect and the angles - wall to ceiling, wall to floor and wall to work surface - should be flush-coved with a suggested radius of 50 mm. Specifically:

a. The floor should be of a sealed construction such as terrazzo or welded polymer sheet with any welds being flat and level; the point loading from heavy equipment must be kept in mind when choosing the flooring material. Local reinforcement with stainless steel plates may be worth considering. There should be no drains for the removal of surface water since they present a microbial hazard. Cleaning is best undertaken by wet/dry vacuuming and the possibility of using such a system merits consideration. Floor-level wash bays for heavy equipment should have a shallow channel to drainage outside the Clean Area. (5.29)

b. The walls should meet the basic specification above and should be chip-resistant, particularly on corners. The surface should be even, with installations - as few as possible - flush and sealed or in a flush-coved mounting plate sealed with a suitable silicon rubber sealant. If the wall is not sealed by a welded sheet of polymer it should be painted to a hard flat finish with a suitable resin-curing paint.

c. Ceilings should be smooth, impervious and sealed in a manner comparable to that for the walls. Lighting units should be mounted flush with the ceiling to avoid dust traps and, if possible, fitted so that lamps can be replaced from above. If light switches are provided within the Clean Area they should be of the contact type, without a rocker arm and sealed into the wall.

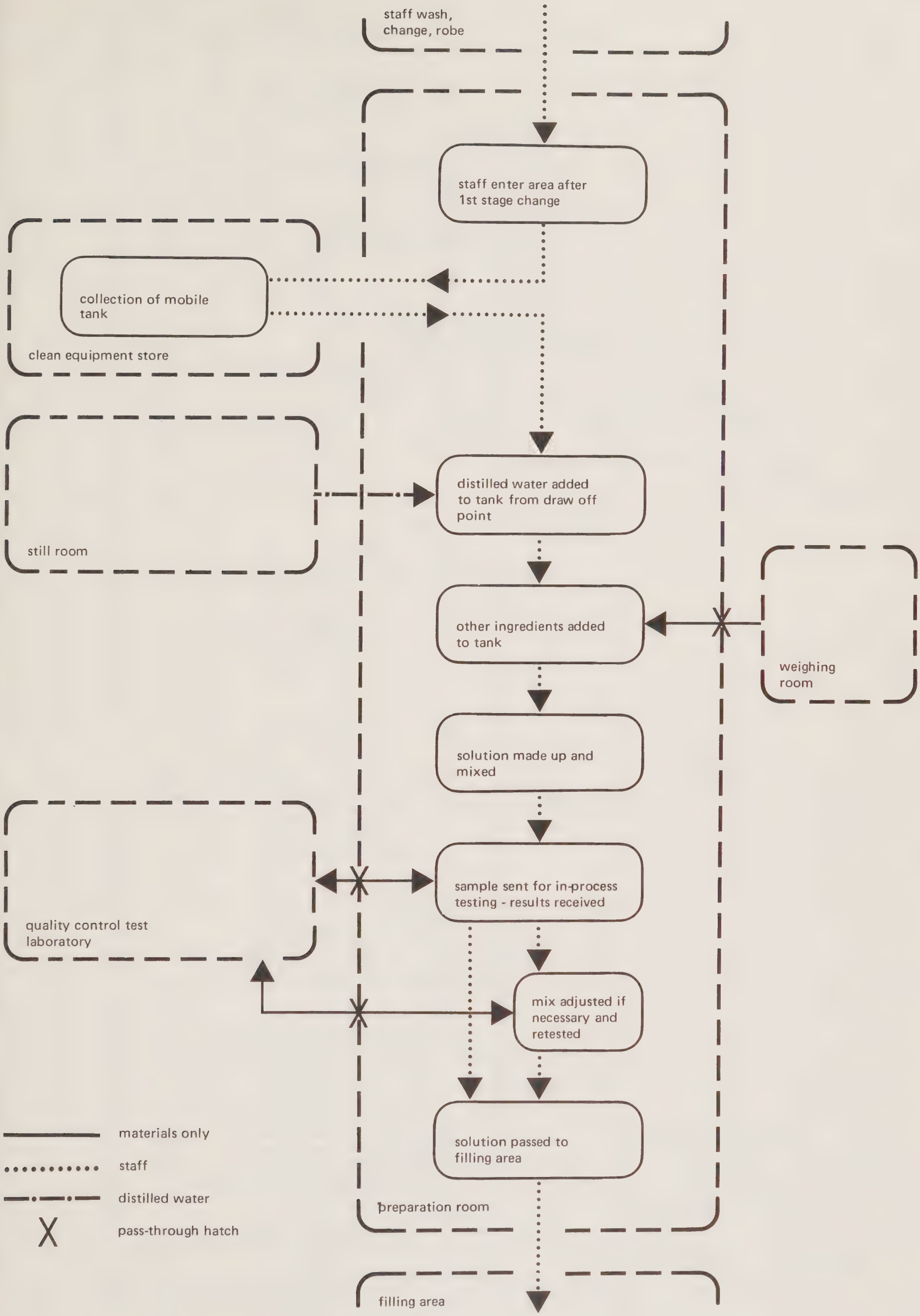



**FIGURE 14 Operations within the sterile manufacturing Clean Area - preparation**

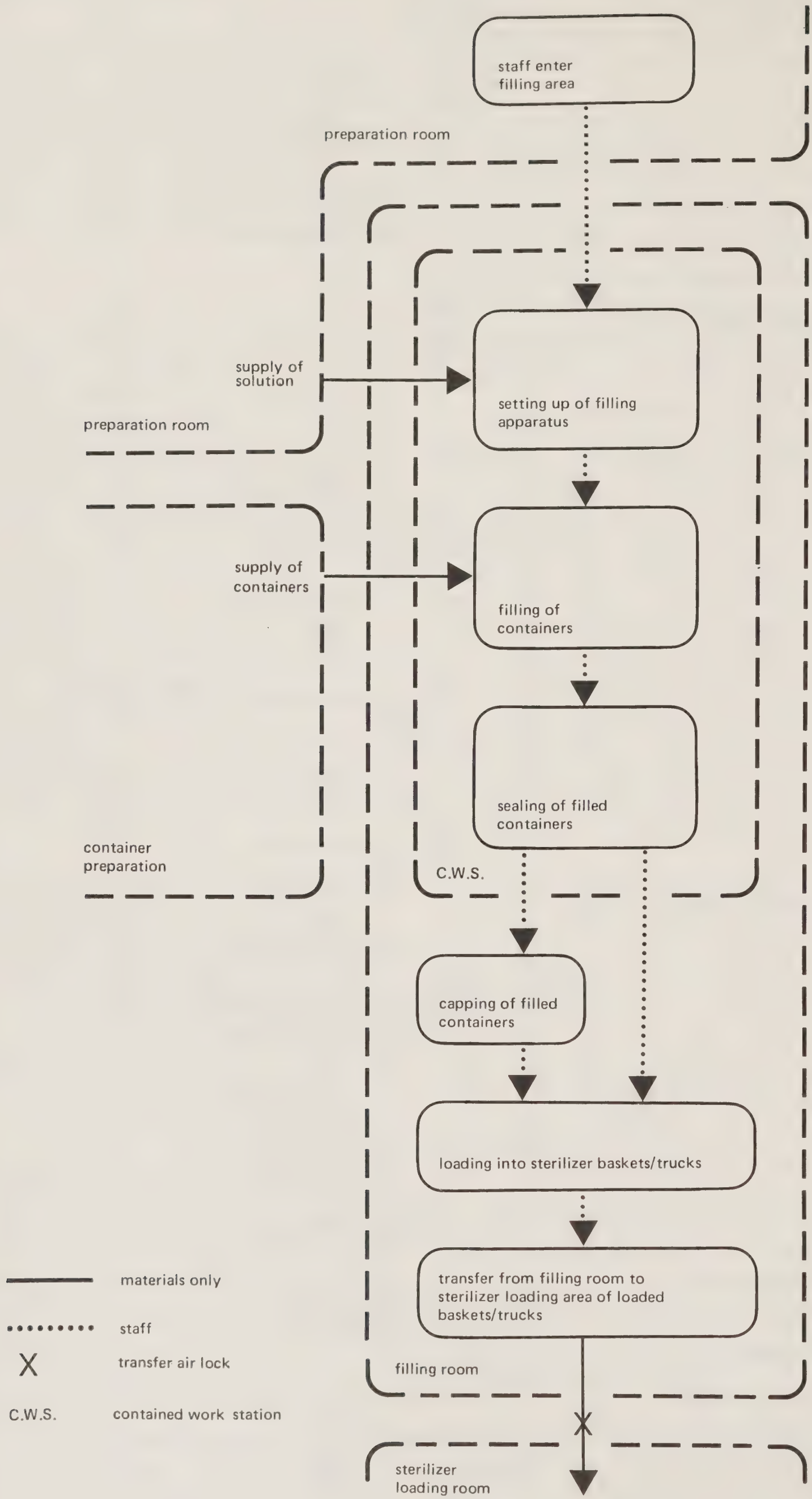



FIGURE 15 Operations within the sterile manufacturing Clean Area - filling

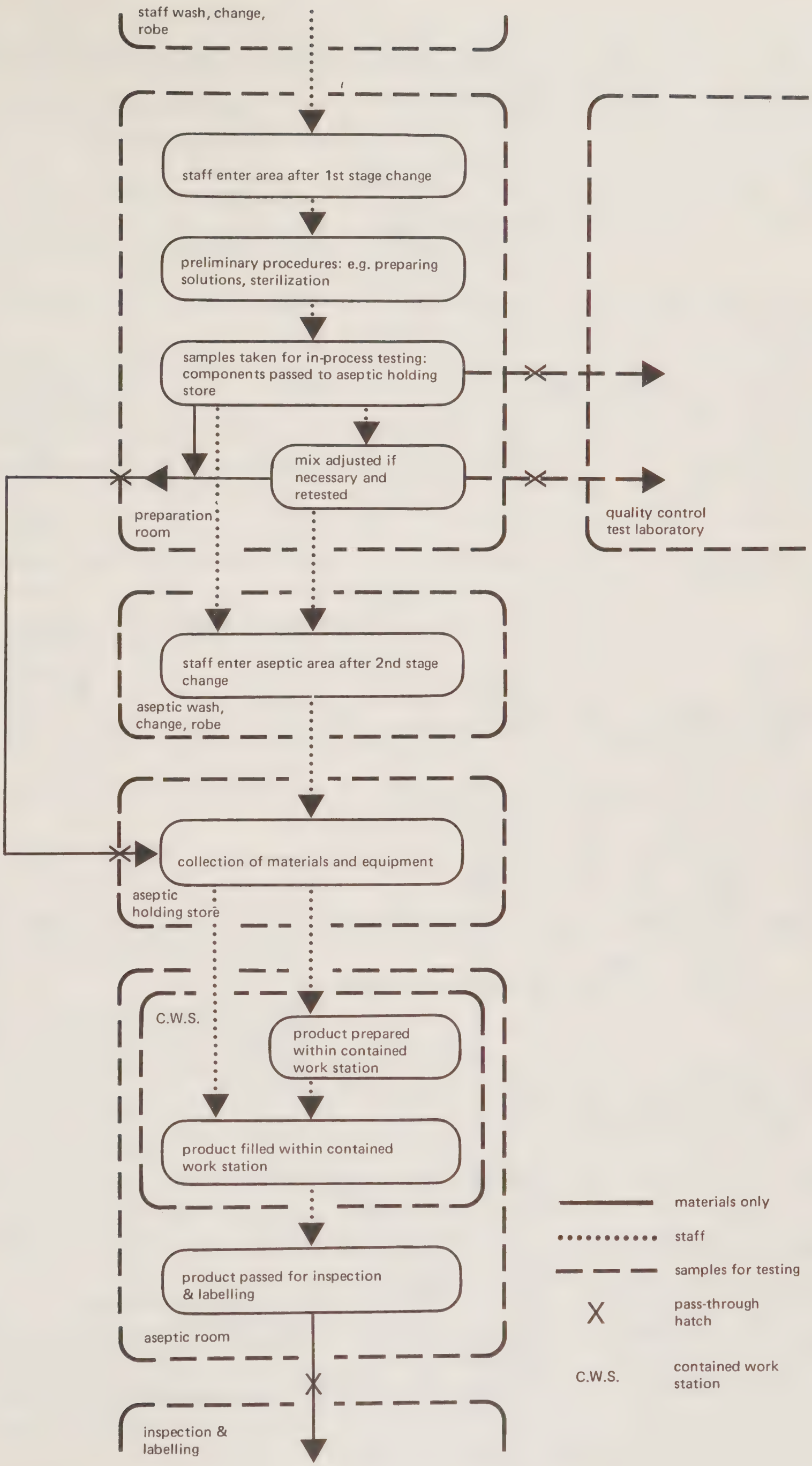



**FIGURE 16 Operations within the sterile manufacturing Clean Area - aseptic filling**

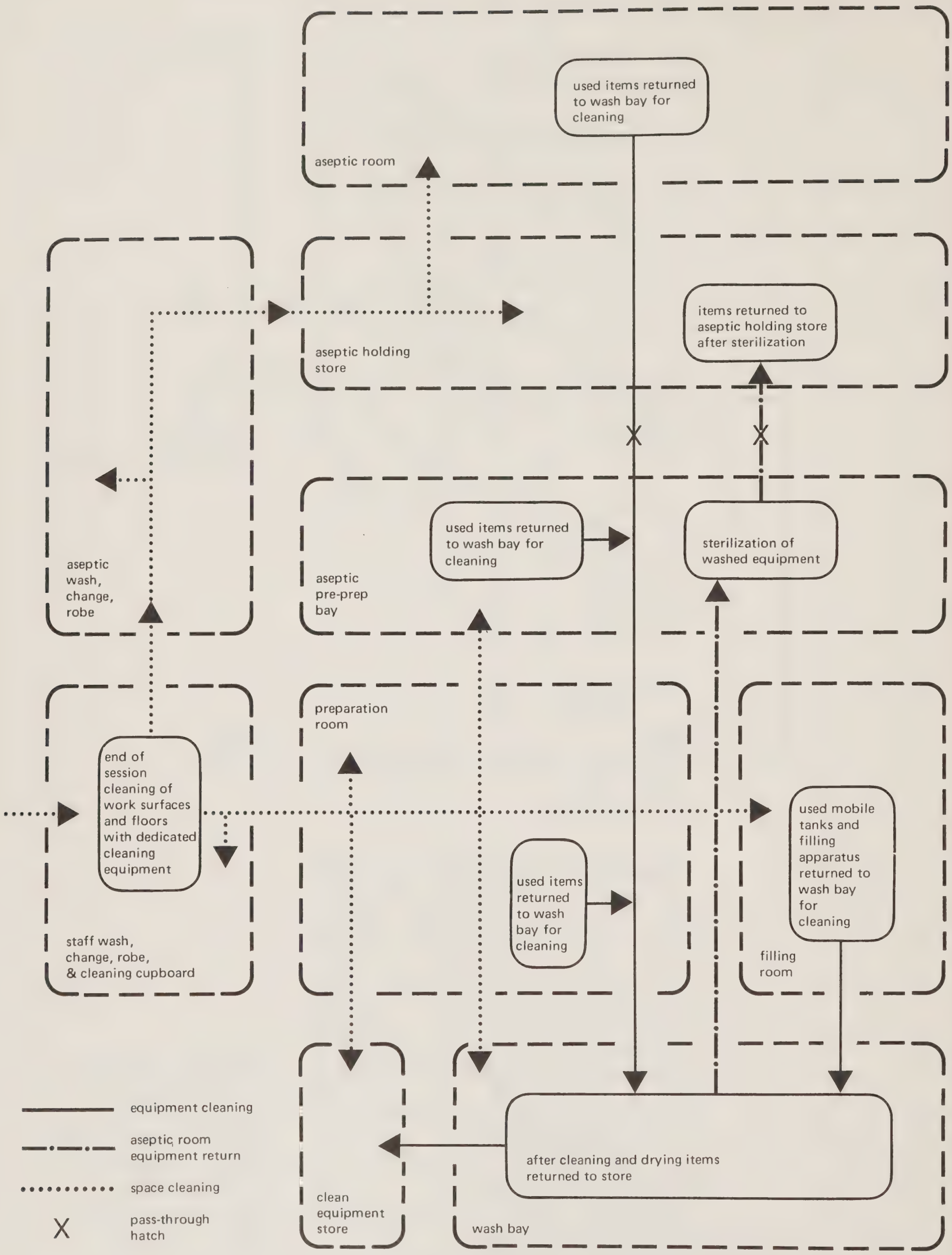



FIGURE 17 Operations within the sterile manufacturing Clean Area - equipment & space cleaning

d. The supervision panels in all the internal rooms must be non-opening and without sills and their surface flush to the wall on the clean side: thus double-glazing will be needed in some situations. If external windows cannot have a northern aspect any measures taken to combat solar gain must not be allowed to intrude within the room.

e. Doors should conform with the basic standard of finishes in this area (5.31). They should fit closely into their frames to maintain air pressures; open towards the higher pressure area; be self-closing; have no latches; be fitted with vision panels (except in changing rooms); and be so placed as to make transit as safe as possible. Doorsets from the Component Data Base range should be suitable for this purpose with some modification. Sliding doors which can create uncleanable recesses are not acceptable. An indicator warning system is recommended to avoid doors at either end of an airlock being opened together. Pass-through hatches should observe similar criteria, including the retention of air pressure by interlocks. If the layout of rooms is such as to create a need for extra fire escape routes it may have to incorporate break-through panels in the walls.

f. It is recommended that working surfaces should be cantilevered, coved and sealed directly into the wall, with the protruding edge also coved. If the wall is finished with welded polymer sheet, one suitable sealing arrangement would be to continue the wall covering over both surfaces and edges of the worktops. Drawers should not be fitted in the Clean Area but a few cupboards may be needed in the preparation room.

**Mechanical Ventilation**

5.32 The main objective of the ventilation, beyond providing a comfortable working environment, is to minimise the introduction of micro-organisms and particulate matter to the Clean Area. For this reason Class 1 and 2 air supply systems should be fitted with suitable warning alarms to indicate failure.

5.33 The standard of air supply for the aseptic room and its changing lobby should comply with Class 1 of BS 5295 and for the rest of the Clean Area with Class 2, with local contained workstations also complying with the BS at the filling areas (Figure 18). It should be noted that areas complying with Class 1 or 2 should be protected by airlocks (such as changing facilities) but that areas with a lower standard of air filtration do not normally need airlocks. The air inlets to the rooms should be placed at high level near one end of the room and outlets at low level near the opposite end – either in doors or walls – to encourage a smooth and uniform air-flow of at least 20 changes per hour; turbulence must be kept to a minimum. In the interests of cleanliness final filters should be at, or near, the outlet end of ductwork, avoiding diffusers wherever possible, and changeable from outside. In relatively small rooms it may be advantageous to use the contained workstation as the source of filtered air to the room. (4.30)

5.34 The ventilation system should also provide a comfortable working environment bearing in mind the constriction of clothing and workspaces. Air pressure needs to be highest in the aseptic and filling areas, then reducing down through the preparation room and passing out through the staff change/wash/robe area; the pressure differentials within the Clean Area should be registered on an external panel of manometers. Suitable warning systems should be fitted to air supplies to indicate failure and should be readily visible to supervising staff. The air conditioning must additionally be capable of coping with wild heat, which can be considerable.

**Distilled water**

5.35 The still room has to provide a supply of distilled water for the unit's needs, mainly for use in preparation of solutions and in the final rinsing of containers/closures. While stored or in transit the water is susceptible to microbial contamination. Measures to avoid this include heating the storage tank(s) to at least 70°C – with 'breathing' through sterilizing grade filters – and keeping pipe-runs as direct and internally smooth as possible. Cooling is needed at draw-off points. Depending on structural design, the following options may need considering:

a. Stills feeding a single tank located close to the preparation and washing areas, with a short (under 2 m) delivery outlet to each.

b. Twin tanks, each having a single outlet to the area it serves.

c. If it is likely that more than two take-off points will be required from the single tank, a recycling ring main is used with the outgoing temperature at least 70°C and the return temperature monitored for 65°C. It should be fitted with an alarm and have an automatic pump mechanism. This arrangement demands a continuous pump, with a reserve pump and bypass to cope with any failure; take-off branches should be kept extremely short. Lagging the circuit can save energy and protect staff but the lagging should be easy to dismantle for inspection.

**Finishing operations** (Figure 19)

**Sterilization**

5.36 Products to be terminally sterilized will pass from the filling room of the Clean Area via a transfer airlock or conveyor. In the former arrangement, the sterilizer trolley is loaded within the filling room and transferred through the airlock via a transfer station located within the airlock itself (Figure 20). In the latter, the trolley is loaded outside the suite. The baskets are loaded into the sterilizer using special sterilizer loading trucks designed to fit the sterilizers used. These trucks can be unwieldy when loaded, so consideration must be given to the space required to manoeuvre them. It is of paramount importance that loads before and after sterilization are not mixed; design of this area can assist such separation.

5.37 Steam and hot air sterilizers should comply with Health Technical Memorandum 10 "Sterilizers", and be sealed into the wall to present a flat, easy-to-clean surface incorporating gauges, controls and thermocouple ports. Single-ended sterilizers are recommended and a local policy decision is required about the best mix of sterilizer

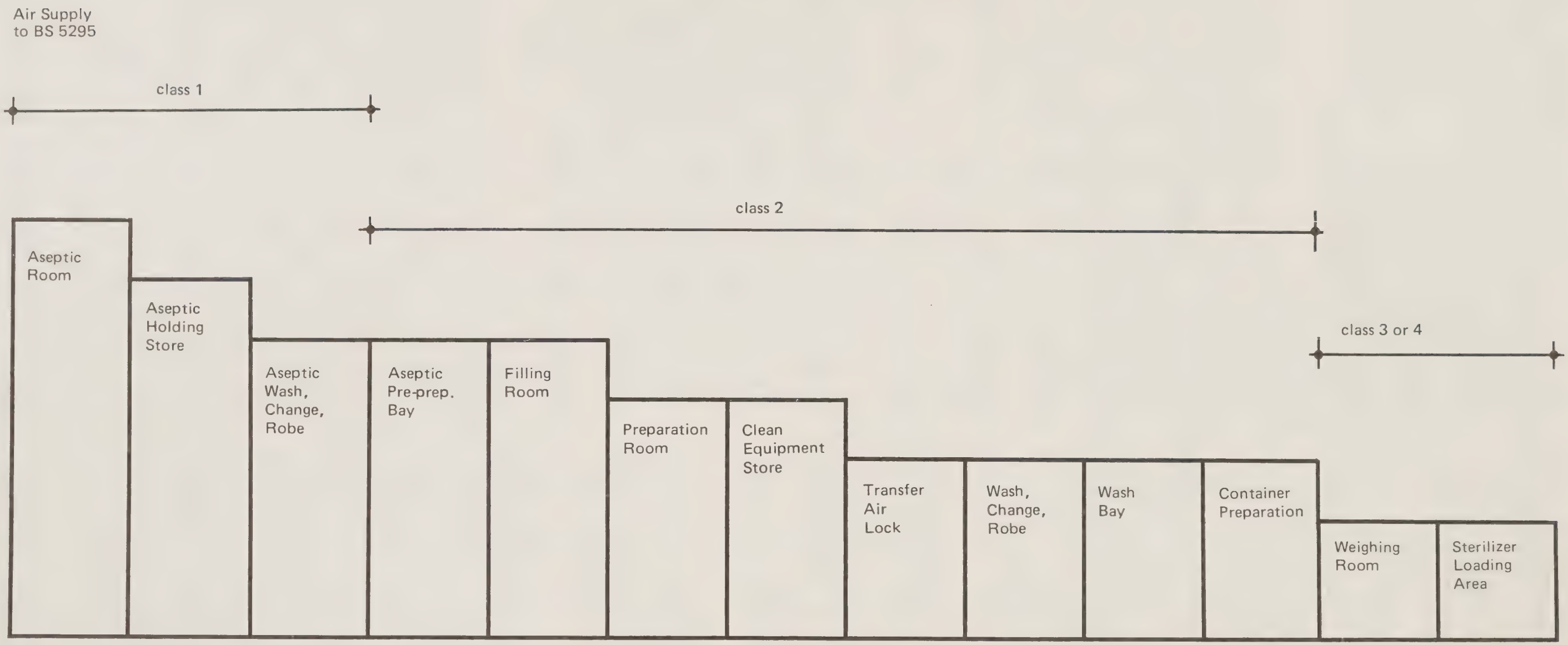



FIGURE 18 Sterile manufacturing: mechanical ventilation pressure gradient

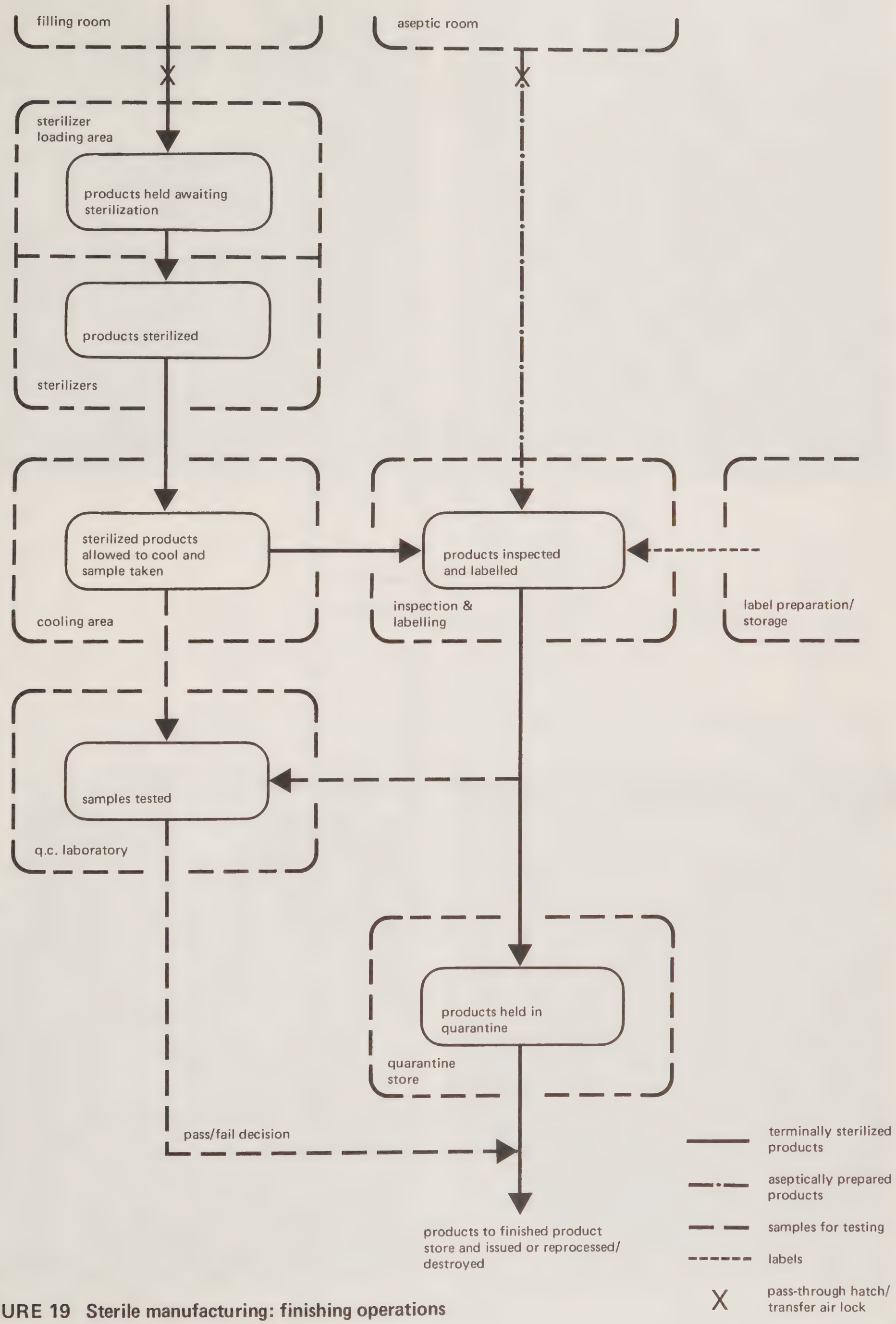
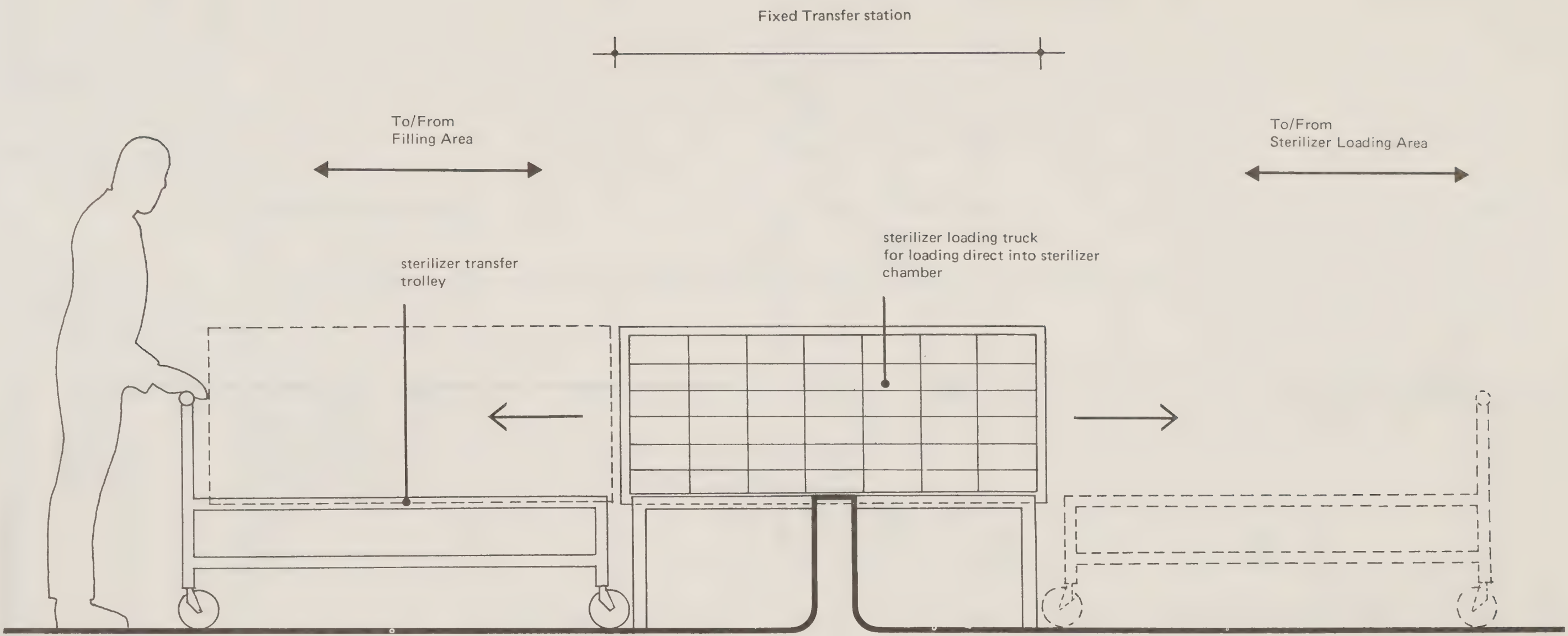


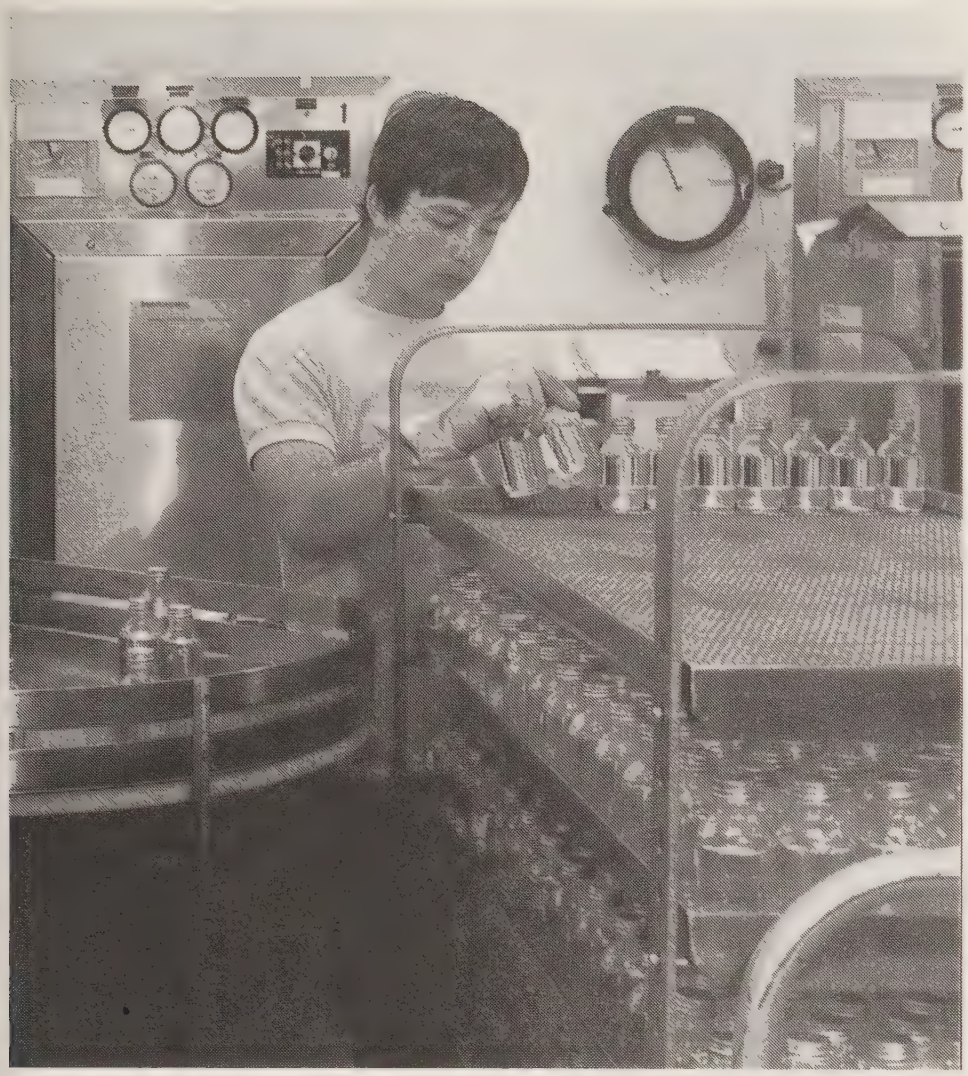

**FIGURE 19 Sterile manufacturing: finishing operations**



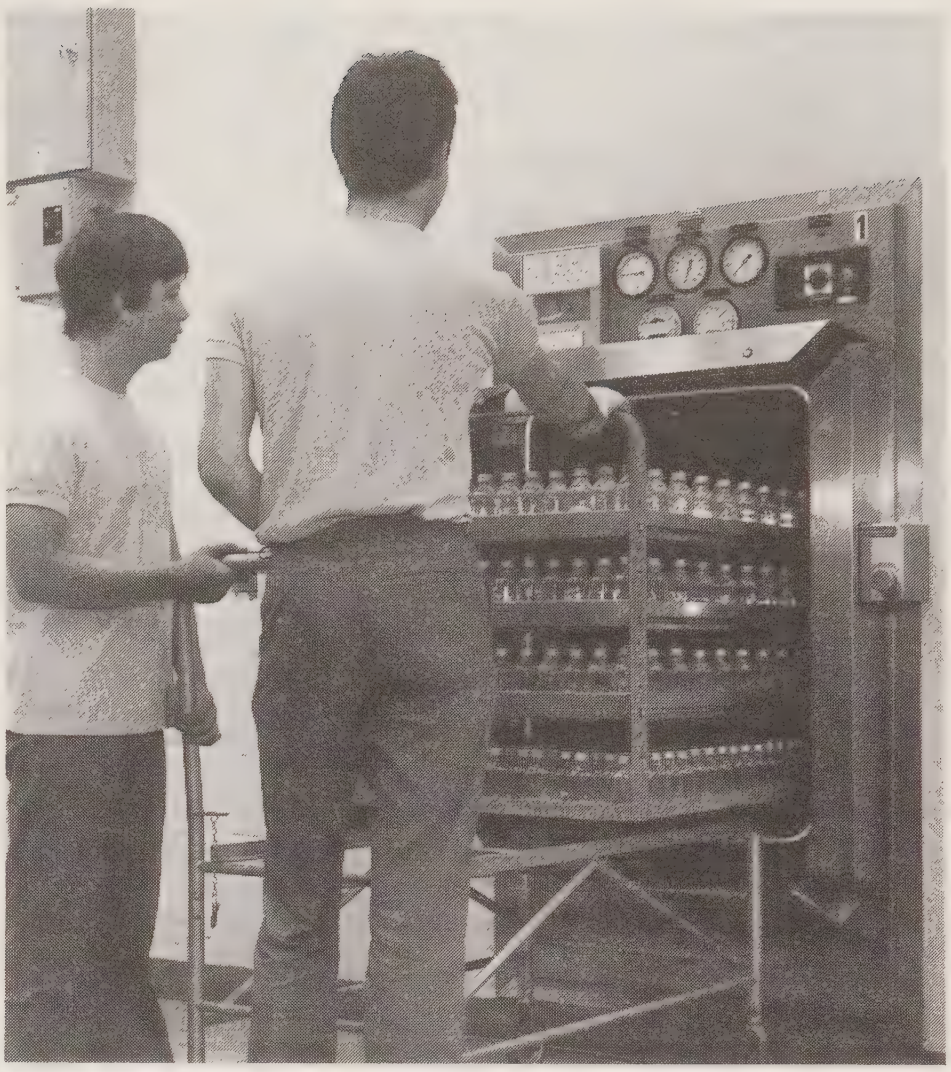

N.B.

Only one sterilizer transfer trolley in transfer air lock at any one time– either from filling room or sterilizer loading area

**FIGURE 20 Sterile manufacturing: cross section through transfer air lock**



Collecting filled containers and loading the sterilizer trolley outside the Clean Area



Loading the sterilizer

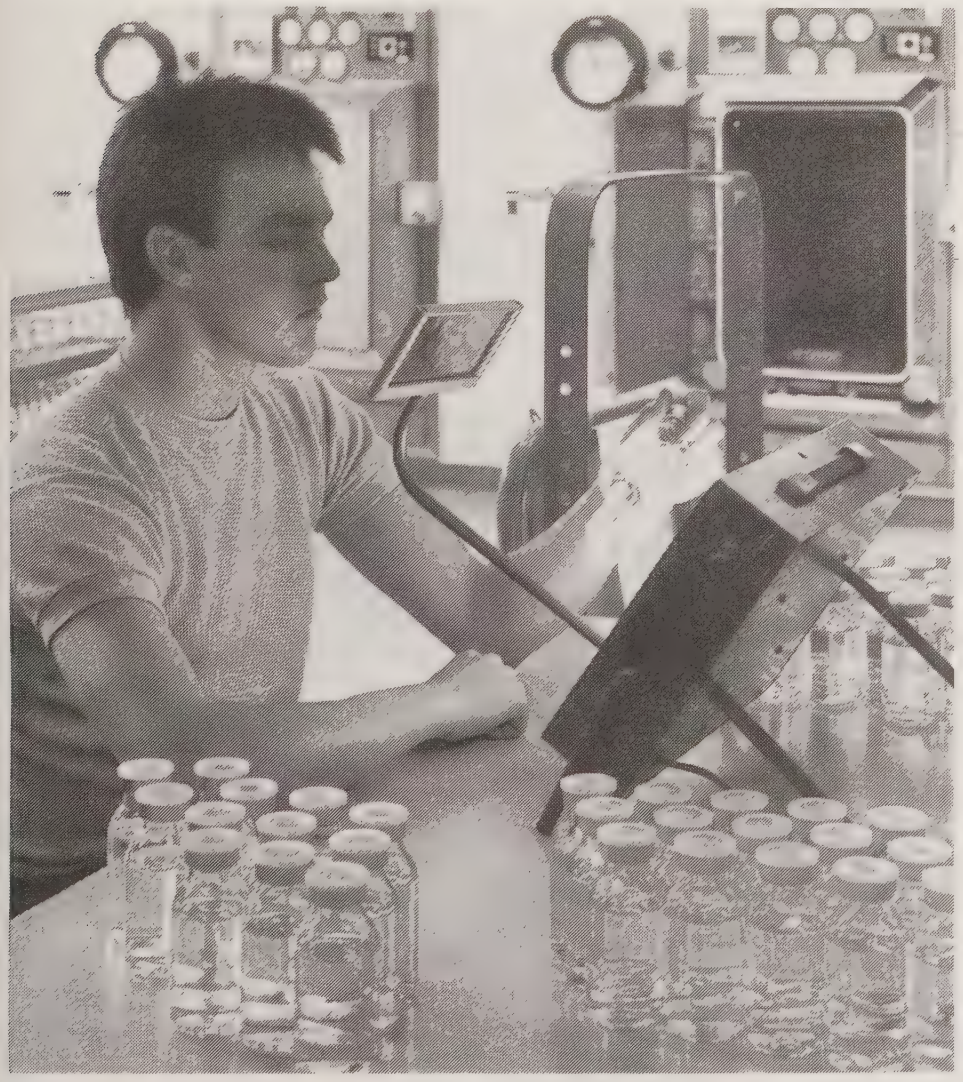
sizes and types to match the product range and batch quantities.

5.38 The bodies of the sterilizers should be housed in a plant room which should, whenever possible, have at least one wall to the outside face of the building with access. Appendix 3 of HTM 10 gives planning information on sterilizers, including dimensions for typical models, heat emission rates and appropriate service connections. Chapter 5 of the same document gives suggested limits on noise and vibration levels when in operation; Chapter 7 gives guidance on installation.

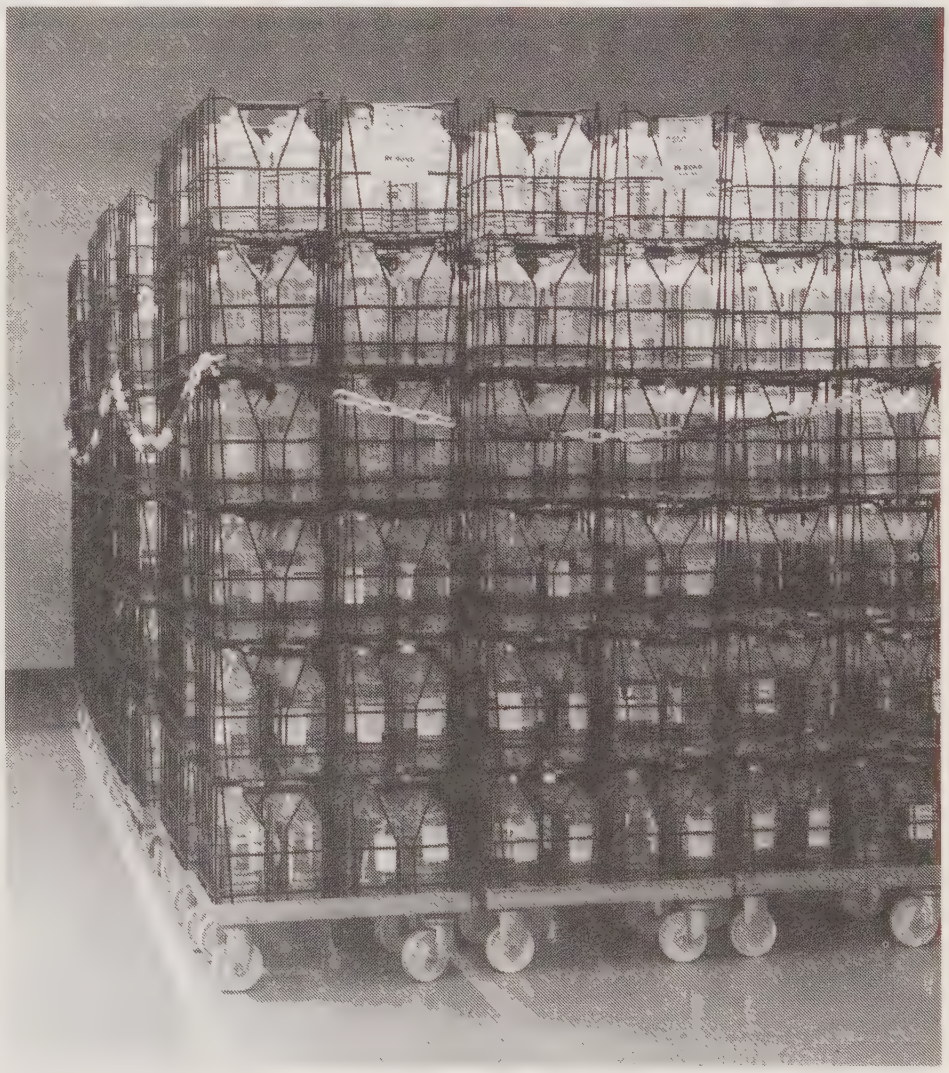
5.39 After sterilization, a period of cooling may be required before the batch can be passed on for inspection; a separate area should therefore be set aside for parking the trolleys with their trucks.

**Inspection and labelling**

5.40 The products are than passed to another area for inspection and labelling. The fitting-out should incorpor-



Inspecting a batch of sterilized fluids



Each batch must wait in the quarantine store for quality control clearance.

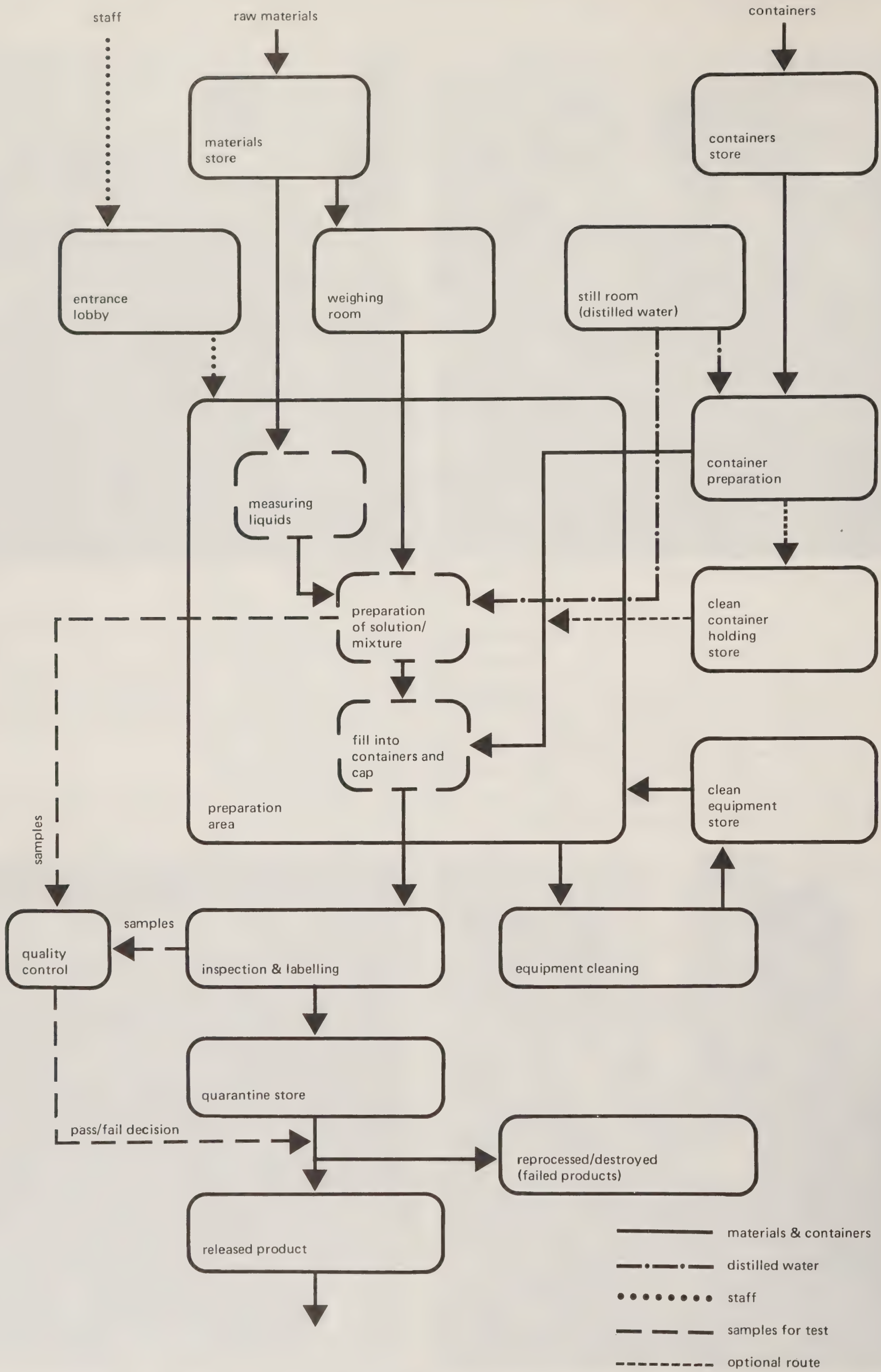



FIGURE 21 The workflow through a non - sterile manufacturing unit

ate facilities for inspection under polarised light and for batch-numbering the labels. When the labels have been prepared, and fixed by hand or by machine, the items are loaded into crates or boxes; they may additionally be loaded on to pallets and shrink wrapped. Each batch must then wait in the quarantine store for quality control clearance before being passed to the finished products store.

## NON-STERILE MANUFACTURING

5.41 This unit is concerned with the preparation of solid and liquid medicinal products for oral or external use which are not required to be sterile, such as medicinal mixtures, powders, suppositories, ointments and creams. This section does not cover the manufacture of tablets, but capsule filling may come within the ambit of a non-sterile manufacturing unit. Again the provision of the Department's circular on manufacturing (Appendix 2) must be considered first before building such a unit. The bulk of the unit's work takes place in a general purpose preparation area, supported by weighing and container preparation rooms, inspection and labelling area, and quarantine stores. (Figure 21)

5.42 On the whole, the standards of premises and finishes required for such a unit are comparable with those for sterile manufacture with less stringent air supply, ie Class 4 of BS 5295 (but see paragraph 5.48 on ointments and creams). Cold water, drawn straight from mains should be available for certain purposes. Tank water is unsuitable. Purified water is also needed. (Storage and ancillary accommodation are covered in paragraphs 5.8-5.13.) Balances will often be larger than required for sterile manufacturing and a buffer store of clean containers may aid work scheduling. Depending on the quality control arrangements, simple in-process tests may have to be performed in a small laboratory.

5.43 An entrance lobby should be provided in which staff may hand-wash and put on clean coats before undertaking the various activities described in the following paragraphs.

### Preparation area

5.44 Since both solid and liquid products will be prepared in this area it must allow for flexibility of use in response to demand. The bulk manufacture of liquid products requires large mobile tanks, with mixing equipment which could be free-standing or clamp-held. Smaller batches of liquids may be prepared on a bench, possibly using a heat-source as well as a mixer. These activities, which may or may not be simultaneous, will require safety measures against possible hazards.

5.45 Depending on the nature and quantity of materials being handled, some form of partitioning into cubicles may have to be considered, possibly with local dust extraction to prevent cross-contamination. These precautions are essential in the case of preparations containing penicillins which create hazards for both pharmacy staff and sensitive patients. The large scale mixing of dry powders, or processing of other materials harmful to the operator, may call for separate rooms operating under negative air pressure. Also, larger scale processing of particular products, eg disinfectants, may call for dedicated facilities.

Non-sterile manufacturing preparation area

5.46 A separate manufacturing area will be necessary for mixing and filling flammable materials. It must be equipped with suitable fume extraction and comply with all relevant safety requirements.

5.47 The preparation area should have associated storage space for a range of small equipment. The cleaning of all equipment is undertaken in an adjacent wash bay which should be able to cater for scouring out the large tanks (by hot water wash, compressed air, or dry steam) followed by drying.

5.48 For the preparation of creams and ointments (which may be applied to broken skin) a space should be reserved which satisfies the air supply criteria of Class 3 of BS 5295. For small quantity batches an electrically heated slab (mounted on or inset into a worktop) should suffice, but larger quantities may require the use of steam heated pans, industrial mixers and special filling machinery.

**Filling and labelling**

5.49 When dry products or small quantities of liquids have been prepared, the process of filling containers can be carried out on the spot. Large tanks of liquids, however, are better handled for this purpose in a reserved cubicle which might also house an industrial filling machine; the environment should be controlled by providing mechanical ventilation through coarse filters.

5.50 The finished products are then moved to a separate place for simple visual inspection and labelling. A bench makes a convenient boundary to this space and assists hand labelling, although a free-standing labelling machine may be used. For large batches, shrink-wrapping and pallet equipment could be required in addition. When several batches are being handled at once there must be some means of keeping them physically separate, eg by partitioning the bench. From this area the batches are transferred to the quarantine store to await quality control clearance.

## ASSEMBLY

5.51 The function of this support unit is to repackage items into different containers, ie in a form suitable for patient use. For the purpose of the following description of facilities it is assumed that only bought-in products are repackaged. A multi-purpose work area is needed and a range of equipment; for example, counting aids for tablets and capsules or strip packing machinery. The exposed product will need protecting from debris derived from the outer packaging of empty containers, which should therefore be unpacked in a separate area. Potent or sensitizing products such as uncoated penicillin tablets or steroid products will require special safeguards, such as local dust extraction. Where the throughput of such products is large, dedicated equipment may be needed to avoid contamination of other products. (Figure 22)

5.52 The large quantity of tablets and capsules which will need to be repackaged from time to time, calls for careful attention to segregation and dust extraction by methods comparable with those described for non-sterile manufacturing. Simple movable dividers between individual workstations can cut the risk of product mix-up in a busy unit; this is further helped by planning for workstations to be free of any storage facility or other encumbrance where a 'rogue' label could lodge. If a large scale packing line is to be used it should be installed in a separate room with appropriate dust extraction.

5.53 It is desirable to keep facilities for filling liquids separate from other functions; the environment should be controlled by providing mechanical ventilation through coarse filters. Creams and ointments which may be applied to broken skin should be handled in a reserved area supplied with air filtered to the standards of Class 3 BS 5295, whilst flammable materials require other precautions.

5.54 Labelling procedures similar to that for manufacturing will apply.

5.55 Simple visual checking on completion should suffice for the products being packed in this area, so a quarantine store would not normally be required (items packed for the non-sterile manufacturing unit would be returned to that unit's quarantine store). Storage should, however, be provided for small items of equipment. Space is also needed nearby for bulk products, empty containers, finished products and labels unless the unit is closely associated with a hospital pharmacy store in which case only separate label storage may be required.

5.56 Although much of the equipment would be cleaned in situ, an area with a stainless steel sink having hot and cold water services should be set aside for washing smaller items and parts of large equipment.

5.57 The pharmacist in charge will require office accommodation. Facilities will be needed for the disposal of waste packaging material and the collection and sorting of re-usable containers. The washing and preparing of glass containers requires a separate area. (5.21)

## QUALITY CONTROL

5.58 The functions of quality control are defined in the "Guide to Good Pharmaceutical Manufacturing Practice". The extent of geographical coverage, utilisation of highly sophisticated equipment, and inclusion of microbiological

Quality control-testing

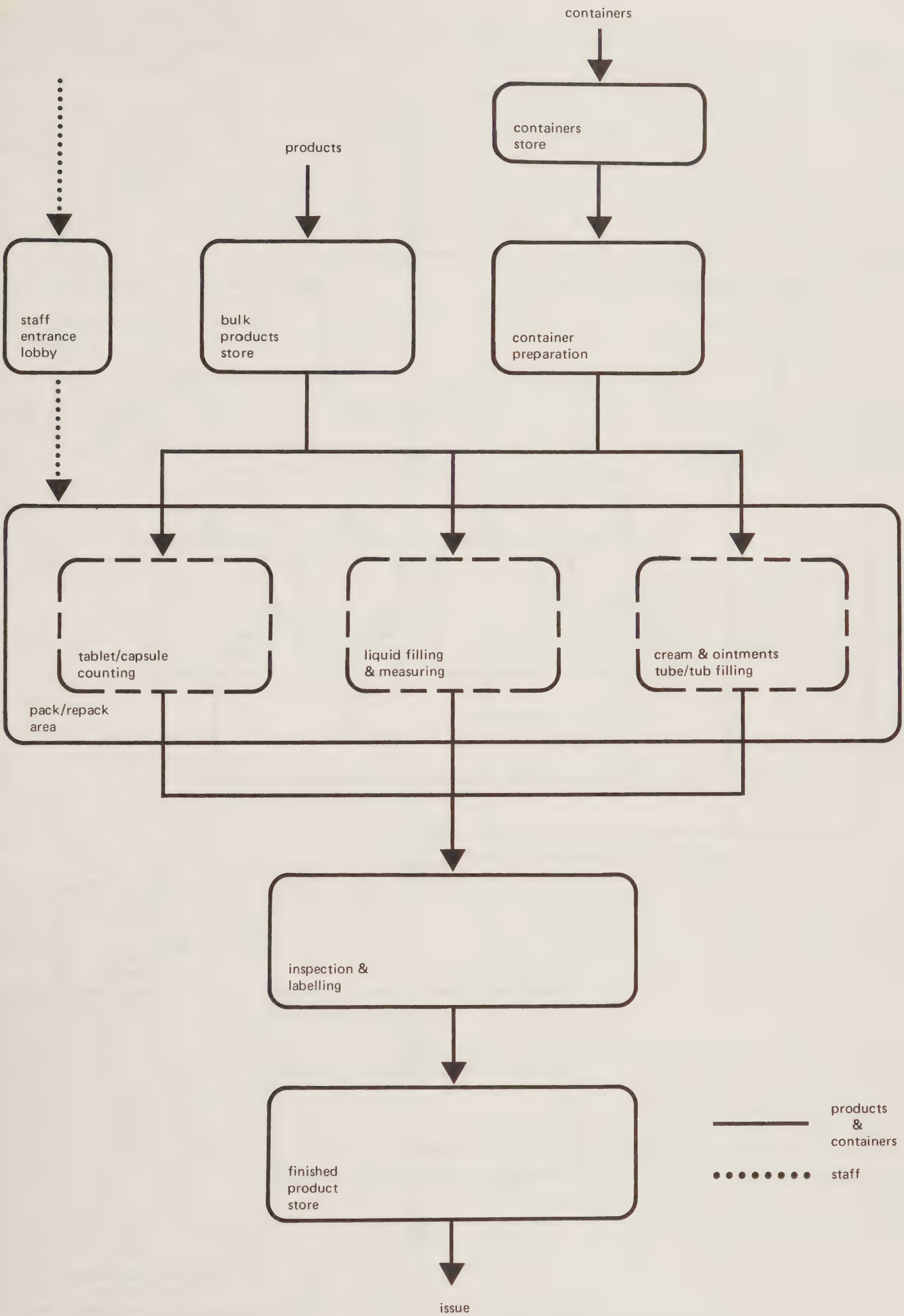



**FIGURE 22 The workflow through an assembly unit**

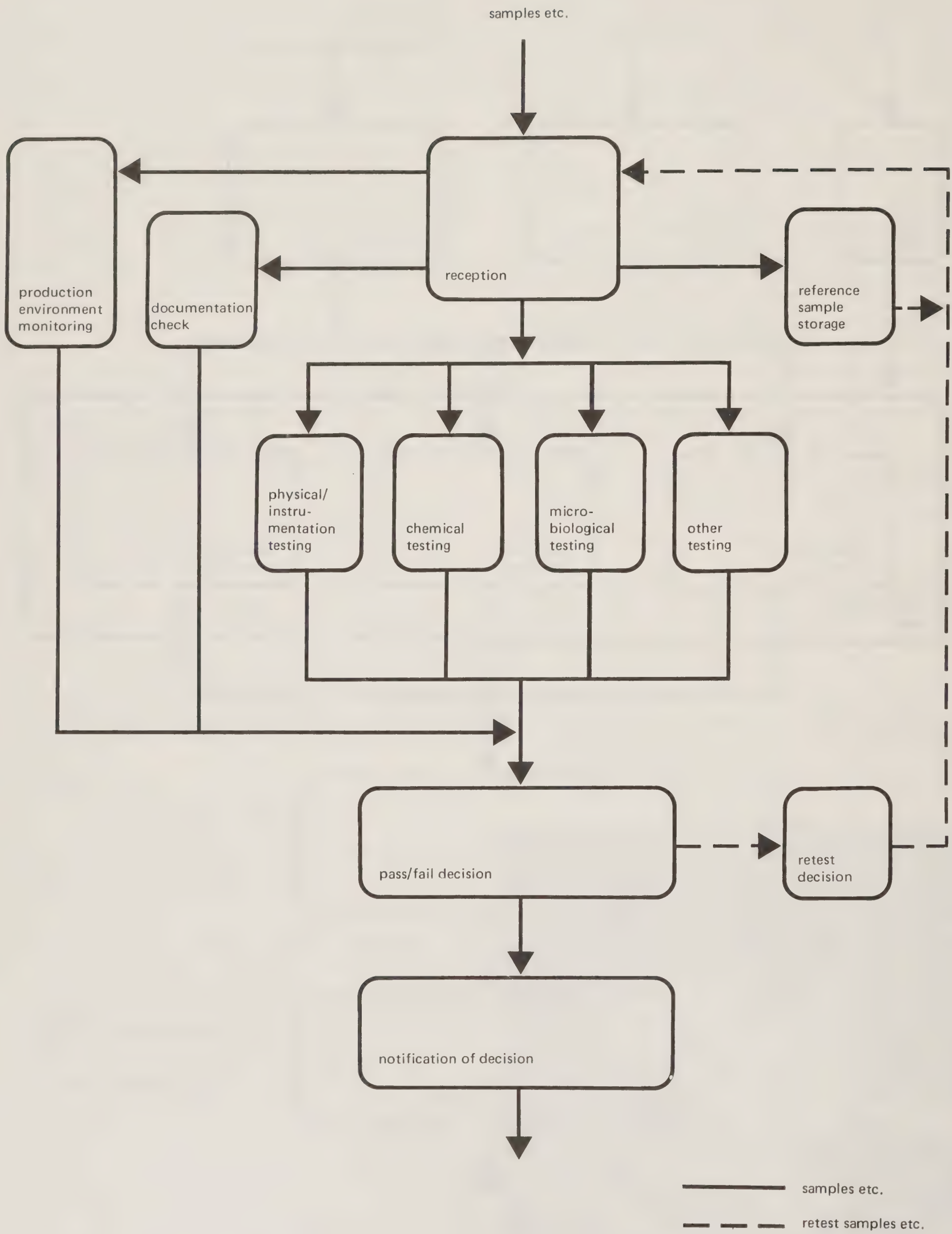



FIGURE 23 Flow of samples from manufactured batches through a quality control unit

testing will be a matter for local and regional policy. Consideration of these matters is essential to achieve a proper scale of provision.

5.59 Facilities will be required for chemical and physical testing of raw materials; materials during processing; finished products from both sterile and non-sterile manufacturing; and for storage of reference samples. (Figure 23) The service participates in the monitoring of environmental conditions and equipment performance in pharmacy manufacturing areas and possibly also in the dispensing and stores areas and medical gas services. Some research and development work is likely to be carried out as well. Advice on design and safety planning for laboratories is given in the Royal Society of Chemistry's publication "Hazards in the Chemical Laboratory".

5.60 Office accommodation for the pharmacist in charge, and the storage facilities for records and documents, should be separate from laboratory areas to minimise the risk of fire in the laboratory area. The pharmacist's office should be sited to allow oversight of the work of the laboratory staff, which may create a need for internal windows. Records and other documents have to be retained for at least two years, and adequate storage space should therefore be provided here or, if in another area, within lockable cabinets.

5.61 If a separate area is reserved for sample reception and associated paperwork, it will reduce the need for other staff to enter the laboratory. The most convenient site for this area is adjacent to or incorporated in the pharmacist's office.

5.62 Full analyses are usually best performed in separate areas with mains services. In addition to the usual compressed air and suction, nitrogen, hydrogen and propane gas may be required; these can be supplied to the laboratory area from an external manifold or by means of cylinders which are housed in a separate medical gas cylinder store when not in use. If acetylene is to be stored and used, special precautions must be taken as outlined in WKO (78)3 "Acetylene Gas Installations". Fire safety considerations will be paramount in this unit.

### Chemical laboratory

5.63 The laboratory should be designed to provide continuous work surfaces in a material resistant to heat and chemicals. Under-bench units are needed for the storage of small items of equipment and glassware, with separate provision for housing burettes. The worktops should provide for several workstations, each within easy reach of services outlets and a small sink. Glassware washing facilities are also required. For selection of fume cupboards see HEI No 86 (June 1980).

5.64 Although the bulk quantities of flammable and volatile solvents should be stored separately in an external isolated store, daily working stocks need on-the-spot storage in a special fire resistant cupboard with tray shelves to contain spillage. Another fire-resistant cupboard, fitted with a welded epoxy resin liner and also dished to contain spillage should be provided for storing acids. Other reagents may be stored on adjustable wall shelving.

### Instrument laboratory

5.65 Adequate worktop space is required on which to stand the instruments. As some of them may be very heavy, it is essential that the worktop be properly supported throughout its length. Under-bench storage will accommodate certain ancillary equipment.

5.66 The instruments used will include a pH meter, conductivity meter, flame photometer, infra-red and ultraviolet spectrophotometers, polarimeter, microscope, tablet disintegration unit, and centrifuge (which may be free standing). Several of these instruments give out wild heat which will have to be dissipated. Each instrument has varied services requirements which should be borne in mind when planning, eg a flame photometer may need separate air extract, supplies of electricity, gas and compressed air, and a drain or drip cup for liquid waste.

5.67 For planning purposes the project team should be fully aware of any regional arrangements for sharing larger and more complex equipment between a group of quality control units, eg gas or high pressure liquid chromotographic equipment.

### Weighing area

5.68 Weighing facilities will be shared by the chemical and instrument laboratories and should be sited away from draughts, preferably in a separate room convenient to both. The delicate operations demand several balances of varying capacities, all firmly installed on a flat (slate) table to minimise vibration.

### Laboratory workshop

5.69 The provision of a small workshop for assembling new items of equipment, or for the repair of apparatus without the need for special tools, would be a useful asset.

### Microbiological testing facilities

5.70 If microbiological testing is to be undertaken, a separate suite designated for this purpose will be required. The construction and finish of such a suite should be broadly comparable to that of a Clean Area although with a less stringent requirement for air supply. The test room will need an air supply to Class 2 and the anteroom to Class 3 of BS 5295.

5.71 The test room would be primarily for sample and inoculation manipulations, ('sterile' samples would be undertaken within a contained workstation) but a pouring bench could be incorporated if media plates are to be prepared locally. The anteroom would contain incubators and equipment for colony counting etc, as well as sterilizing equipment for media and for disposal purposes. Handwashing facilities and storage for clean garments, gloves etc, should also be provided, but not to the standard necessary for sterile manufacturing or dispensing purposes.

### Pyrogen testing

5.72 Testing for pyrogens may be performed, depending upon local policy and procedures, although separate and additional facilities are unlikely to be required for this purpose.

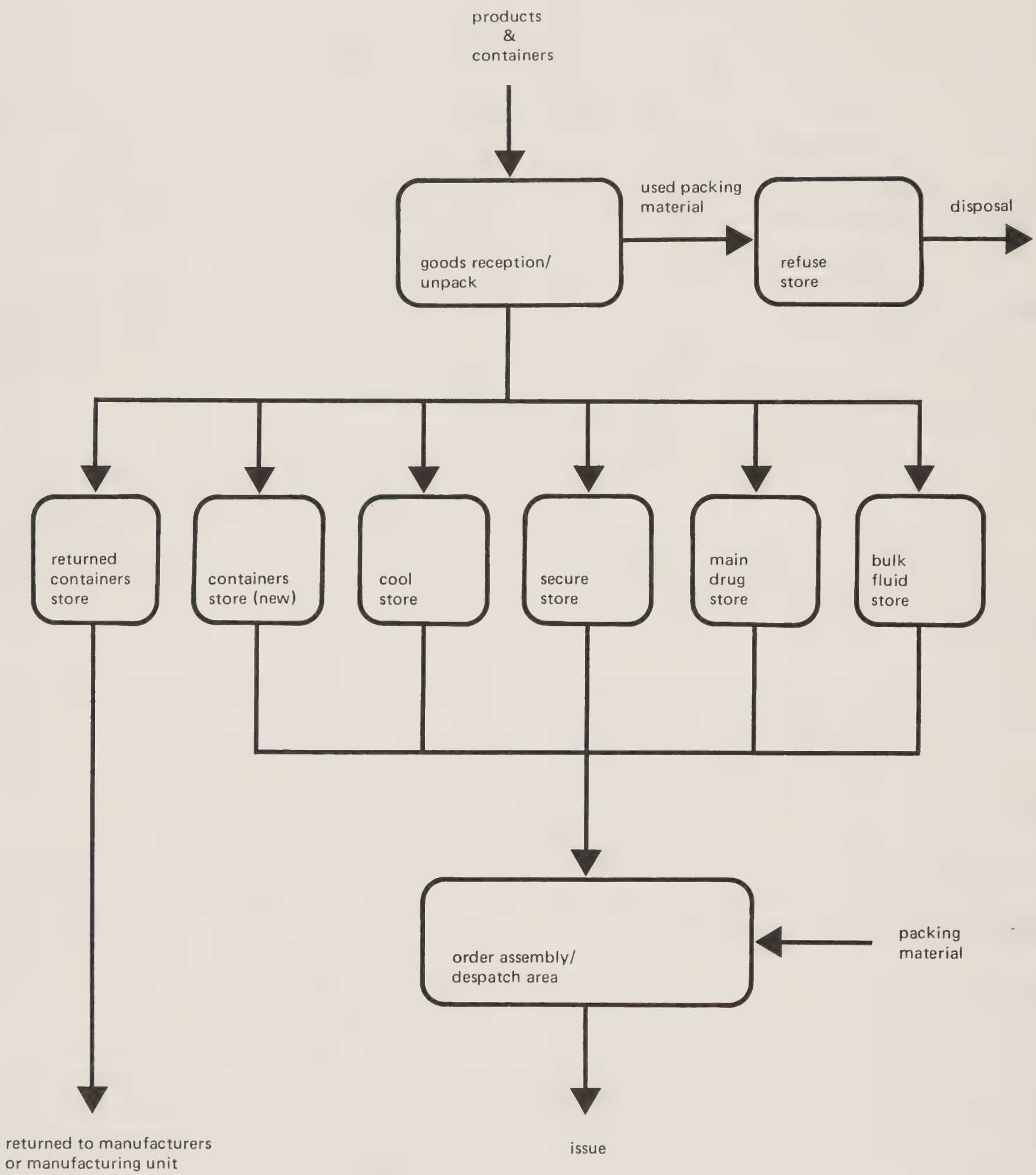



FIGURE 24 The workflow through a purchase & distribution unit

**Research and Development**

5.73 Research and development work in most cases does not require separate facilities. However, if radioactive tracer compounds are used it must be in a separate small laboratory which includes a fume cupboard, sink and bench space, (all capable of supporting lead bricks for shielding) and a lead lined store for the reagents. Further guidance on handling radioisotopes is given in various publications, including the "Code of Practice for the Protection of Persons against Ionising Radiations from Medical and Dental Use (1972)" (Chapter 6).

**Reference sample store**

5.74 Reference samples of raw materials and of items manufactured by the pharmaceutical support services should be kept for an appropriate period. A separate locked store should be reserved for this purpose as part of quality control; its environment and fittings are similar to those of a general pharmacy store and a refrigerator will be required for certain small items. Special arrangements must be made if samples of Controlled Drugs are being kept for reference purposes.

**Other storage**

5.75 Depending upon the availability of pharmaceutical stores nearby, the unit may have to purchase and store its own materials. In addition, refrigerated storage may be required for some reagents in the laboratory. If the unit undertakes environmental monitoring in clean areas and medical gas pipeline testing, the instruments for these purposes will need storing under appropriate conditions.

**Computer facilities**

5.76 Computer facilities might be used by the unit for calculations or record purposes, depending upon local policy. This equipment should be located adjacent to the pharmacist's office, although connections may be required to the laboratories if, in addition, the computer is to monitor and control the analytical process.

**Purchase and Distribution**

5.77 Economies can often be made by centralising in one unit the purchasing and distribution arrangements for a number of hospitals. The support unit would also purchase for the manufacturing and assembly units, and could provide the storage requirements for them, thus an adjacent location would be advantageous. If the unit is to handle materials which are subject to quality control measures it will need facilities for quarantine as well.

5.78 The reception and unpacking of supplies and the assembly of orders for despatch will play a more important part in the unit's workflow than in a pharmacy department providing solely for patient services. (Figure 24) Stock turnover will be faster, thus making more economic use of storage space, and this would be reflected in the balance between stores and working areas. The disposal of considerable quantities of waste packaging materials needs to be considered at an early stage and an external collection point is recommended. Advice contained in the "Guide to Good Pharmaceutical Manufacturing Practice" (Chapter 18, Good pharmaceutical wholesaling practice) could be applied to this unit.

5.79 The bulk of materials likely to be handled makes it desirable to provide an exclusive unloading bay, off a suitable access road and capable of accepting an articulated lorry with a 20 ft trailer with enough room for reversing manoeuvres, as well as smaller vehicles. This bay should have direct access to the unit's goods reception and unpacking area and be approachable directly from the despatch assembly area. It should be protected against the risk of contamination from outside sources. Pallets, wire-mesh trucks and other mechanical handling methods may be used both indoors and outside.

5.80 This unit would not be expected to stock flammable materials or medical gas cylinders unless it is directly associated with the primary (hospital) services. In all other respects the separate stores required, their functions, general storage conditions and other considerations follow the lines already set out in paragraphs 4.44-4.49. However, the support unit needs to handle a larger quantity of each type of goods, perhaps several times more than that held at hospital level; transfusion fluids in particular would require a large amount of space. It may be decided that the unit should not stock particular items, eg Controlled Drugs (for security reasons) and such considerations would modify the facilities required.

5.81 A further function the unit could perform would be to collect from dependent pharmacies any items due for return to manufacturers, such as products subject to a recall. It might be necessary to set aside a separate (secure) area for this task.

5.82 Staff accommodation should include a portering base and office accommodation for the pharmacist in charge and clerical staff (with facilities for storing the purchase records etc). Facilities for computer equipment will be required, also parking/recharging space for the trolleys and mechanical handling equipment.

# 6 Functional Requirements for the Preparation of Radiopharmaceuticals

## Introduction

6.1 This chapter is devoted exclusively to the facilities required for the preparation of radiopharmaceuticals. Its place within the pharmacy building note is not intended to diminish the contribution made by physicists, radiologists, and other clinical and scientific staff to the multi-disciplinary arena of the use of radiopharmaceuticals in hospitals and only the preparation of these materials is considered here. In due course this chapter may form part of a revised Design Guide on Radioisotope Services.

6.2 Radiopharmaceuticals, as the name implies, are medicinal products which achieve their diagnostic or therapeutic purpose by virtue of the radioactivity they contain. Examples of their use include producing scans of diseased tissues on imaging equipment; and, by positioning them within the body, effecting treatment by irradiating certain organs. Since radiopharmaceuticals are both medicinal products and radioactive substances, Medicines Act controls and radiation safety controls apply.

## General Requirements

6.3 The preparation of any radiopharmaceutical product is considered to be a form of manufacturing or assembly under the terms of the Medicines Act, and therefore, the recommendations given in the "Guide to Good Pharmaceutical Manufacturing Practice", Chapter 13, apply. The local Medicines Inspector should be consulted, particularly when designing facilities concerned with the use of 'open' manipulations. (6.13)

6.4 The design and operation of any radiopharmaceutical preparation facilities within a hospital requires the close co-operation of the hospital's radiation protection adviser. The Ionising Radiations Regulations 1985 lay down basic safety standards in all fields of employment involving radioactive materials. Guidance specific to the health field is given in the 'Code of Practice for Protection of Persons against Ionising Radiation from Medical and Dental Use (1972)'; this will be replaced by revised guidance at present being prepared by the National Radiological Protection Board. The Radioactive Substances Act 1960 controls the holding and disposal of radioactive substances, and the Radioactive Substances (Carriage by Road) (GB) Regulations and the associated code of practice, cover the carriage of radioactive substances by road. Legislation is also being prepared to enable the UK to comply with an EC Directive on the protection of patients undergoing medical exposures to ionising radiations.

6.5 Specific guidance on the preparation of radiopharmaceuticals in hospitals has been produced from time to time, notably the Department of Health and Social Security Guidance Notes for Hospitals on the Premises and Environment for the Preparation of Radiopharmaceuticals (1982) (the value of which is acknowledged in drafting this Chapter), and Nuclear Medicines Communication Volume 1, which is now the definitive document and supersedes all documents before 1982.

## Location

6.6 The siting of facilities for the preparation of radiopharmaceuticals requires the same careful consideration as for other pharmaceutical services. Typically radiopharmaceuticals have short half lives so the preparation, delivery to the clinic and administering to the patient should take place within the working day. This may limit the cost effectiveness of any centralisation within such a service, particularly in rural areas; although a pattern of simple facilities using the 'closed' technique (6.11) backed up by one or two larger units per region, may prove to be more flexible and productive than a handful of large units in an urbanised region.

6.7 The project team will need to consider the public health protection aspect when deciding on the location of a unit within a particular hospital. The radiopharmaceutical unit should be located as near as possible to where the treatment and scanning of patients takes place. The unit should be self-contained for purposes of good manufacturing practice control. All staff working with radiopharmaceuticals will require suitable extra training in addition to that provided within their own disciplines.

## 'Closed' and 'Open' procedures

6.8 Procedures used in the preparation of radiopharmaceuticals are similar to those used in sterile manufacturing, notably aseptic dispensing. The extra factor with radiopharmaceuticals however is that there are a range of 'kits' available commercially for commonly used preparations, which simplify the procedures by making available the required set of sterile reagents or ingredients. A kit may include a radionuclide generator which provides a radioactive solution called the eluate. When a generator is operated in accordance with the manufacturers' instructions, it can be considered as a closed system and provide a sterile eluate. The simple operation of passing the eluate from the generator to a rubber-capped vial can be regarded as a 'closed' procedure. Some kits contain ingredients in ampoules rather than rubber-capped vials or generators; the Departmental guidance notes consider the use of such material also to be part of a 'closed' system, provided the ampoule is opened only within a contained workstation, only one withdrawal is made, and the contents are added immediately to the closed container (by a hypodermic syringe with the needle inserted through the rubber closure). Any other procedure, whereby an ingredient or partly finished product after

sterilization is open to the atmosphere by not being enclosed in a vial, syringe, generator or other sealed container, is considered an 'open' procedure. Open procedures are now rare even in blood labelling and research programmes.

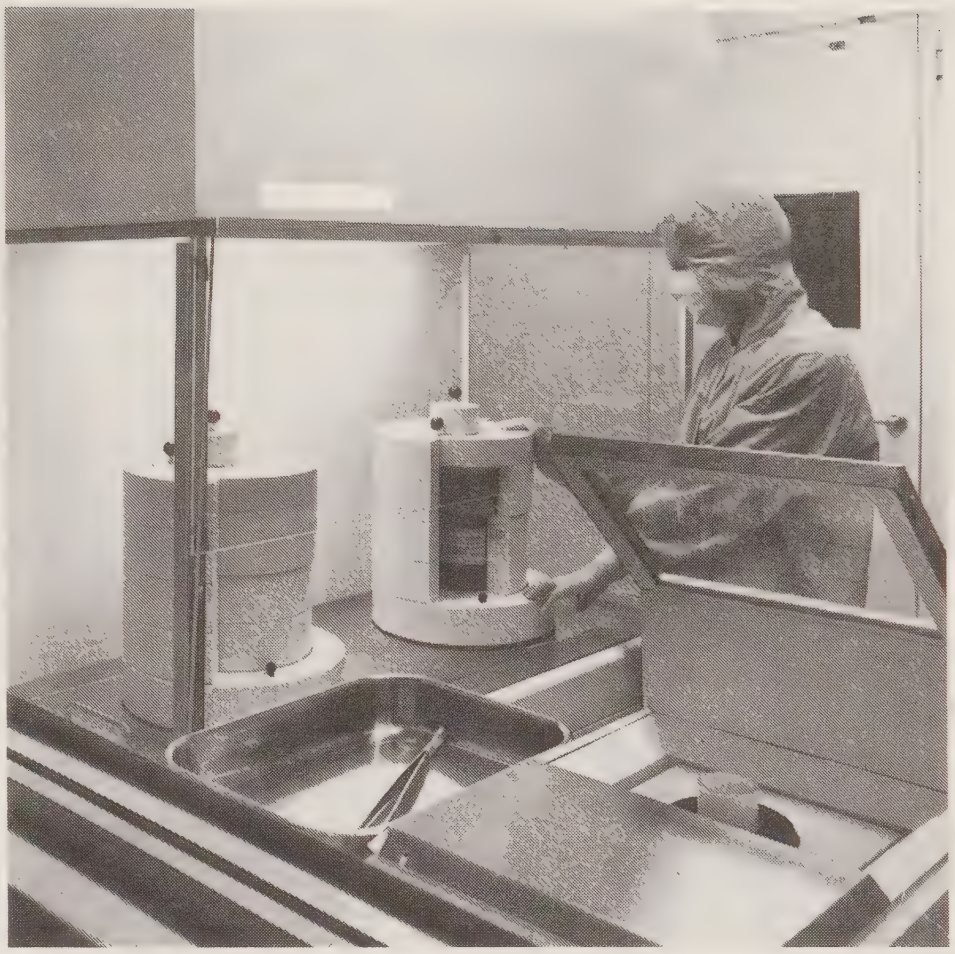
6.9 The range of procedures to be undertaken - whether only closed or a mixture of closed and open procedures - has to be assessed critically before any decision on preparation facilities is taken. The Departmental guidelines allow some flexibility in the provision of facilities for closed procedures, but are more restrictive where open procedures are concerned. Special considerations apply if human blood is to be 'labelled' with a radioactive substance (6.17), whilst products administered orally or by inhalation may require less stringent precautions. The majority of radiopharmaceuticals are administered to patients by injection, within the working day of preparation, and so must be sterile.

6.10 Although there are differences in the facilities required for closed and open procedures, there are many similarities in the routine of such operations. Manipulations are performed on trays to contain any spillage; all potentially contaminated waste materials (including syringes, needles and operative's gloves) are collected for separate disposal. The environment must be monitored within the working area for radioactive contamination. Microbiological environmental monitoring must also be performed to ensure continuous assessment of facility performance and operator technique. On completion all preparations must be assayed for content of radioactivity (dose calibration). Other quality control procedures should be performed, some of which may need to be by retrospective analysis. All preparations which are stable at 2-8°C should be stored in a refrigerator until required. On leaving the radiopharmaceutical unit, protective clothing, including gloves, must be removed, hand-washed and monitored for radioactive contamination.

**Facilities required for 'Closed' procedures**

6.11 Closed procedures can satisfactorily be undertaken in facilities of a less stringent standard than for open techniques, provided that the resulting products are used on the same working day. Manipulations should be performed within a radiopharmaceutical workstation with environmental cleanliness maintained to Class 1 of BS 5295 for product protection and Class II BS 5726 for operator protection.

6.12 Where a generator is employed, it should be stored and used within a radiopharmaceutical workstation wholly devoted to that purpose, and located away from other workstations used for other activities. Whether housing a generator or not, the radiopharmaceutical workstation should be in a room with a good standard of hygiene, preferably supplied with filtered air, as specified in Class 3 of BS 5295. Storage space should be provided in a support room for sterile vials of reagents, solvents and other materials used. A staff changing facility will be required. (Figure 25)



Radionuclide generators are stored in a radiopharmaceutical workstation.

**Facilities required for 'Open' procedures**

6.13 The more stringent standard of facilities required for the operation of open techniques basically equates with those for sterile dispensing operations. Those sterile products which are terminally sterilized by autoclaving, may be made in a clean room supplied with air filtered to the requirement of Class 2 of BS 5295, and which is entered via a changing room/air lock with hand washing facilities.

6.14 Where sterile radiopharmaceuticals are prepared by aseptic technique, an aseptic room with air filtered to Class 1 of BS 5295 and a radiopharmaceutical workstation is necessary, with a two or three stage change procedure. The clean room (referred to above) would then function as a preparation and support room where tray assembly and other preparatory work prior to aseptic manipulation

Assaying the radiation level of a radiopharmaceutical preparation

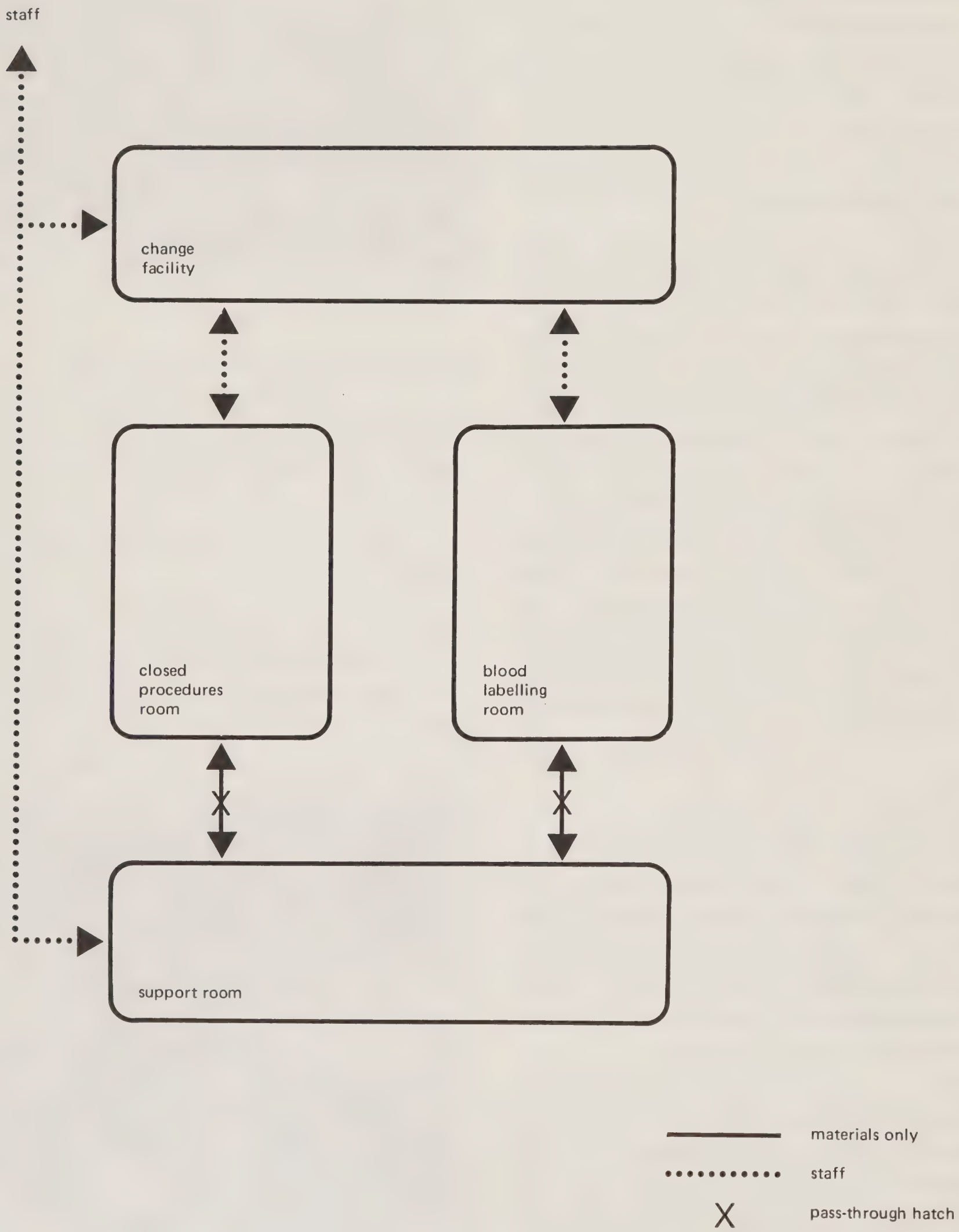



FIGURE 25 Movements through a radiopharmaceutical unit for closed procedures only

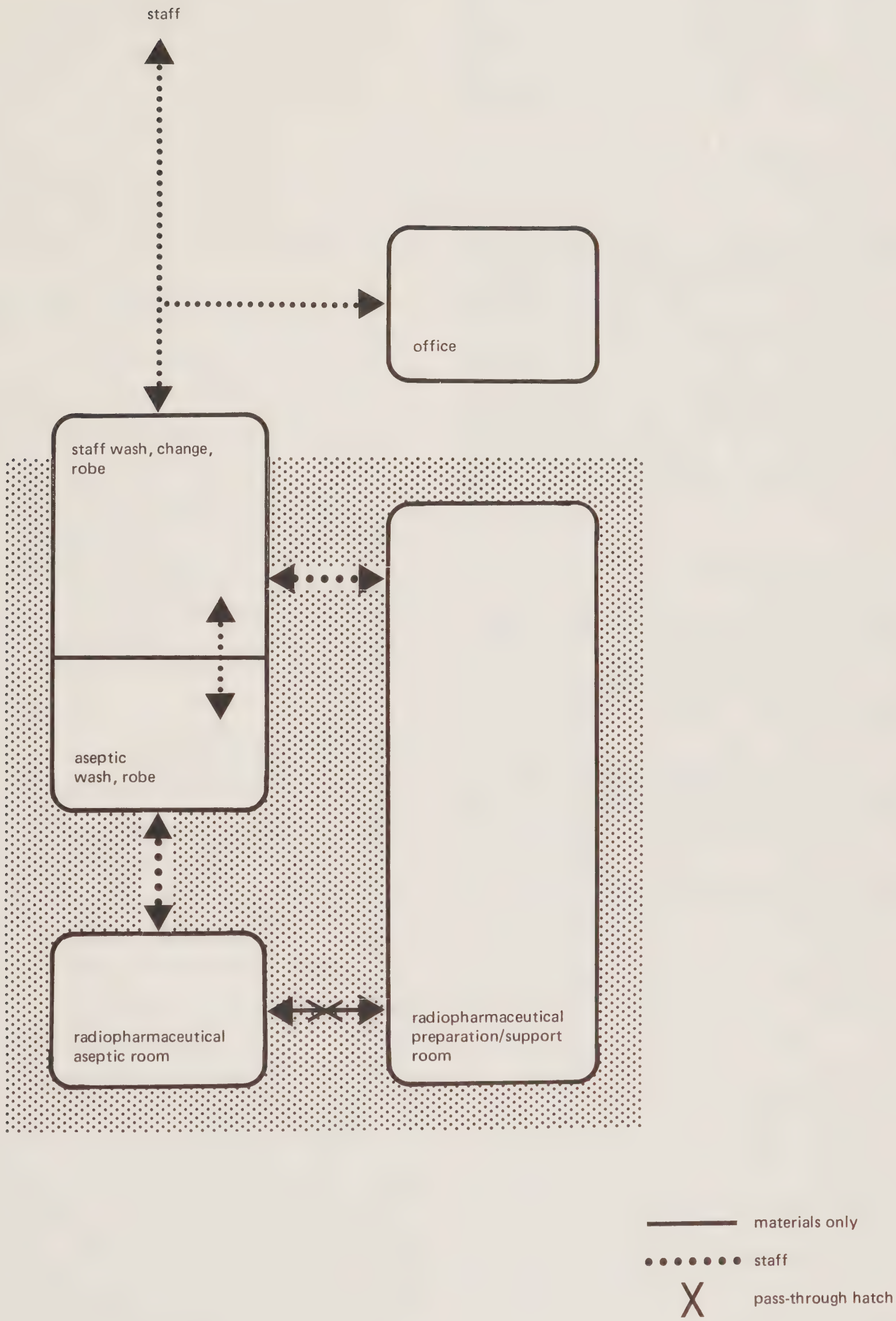



**FIGURE 26 Movements through a radiopharmaceutical unit for preparations requiring open procedures**

(Clean Area within shaded portion)

would be undertaken, and where simple quality control checks, attaching labels to the final containers, and updating current records could take place. (Figure 26)

6.15 Materials transfer between the aseptic and preparation/support room, should be via an airlocked pass-through hatch with staff connection through the conjoint changing facilities. (4.31-4.36) Radiation assay equipment will need to be housed in the preparation/support room, and the final products should be stored in a refrigerator prior to issue.

6.16 Office accommodation for storage of records, etc is also advantageous.

**Blood Labelling**

6.17 Where human blood is handled for radioactive labelling purposes, it is desirable that this should be done in an area separate from other radiopharmaceutical preparation, in view of the additional risk of viral contamination of other products and of infection of the operator. Where blood labelling is performed frequently, a separate room is advisable, complying with the requirements appropriate for closed or open procedures (outlined above) depending upon the techniques to be employed (closed procedures should be adopted wherever practicable). Where only occasional blood labelling is to be performed, this may take place in a dedicated workstation. The Departmental guidance notes provide advice about specific precautions to be taken.

**Radiopharmaceuticals for Oral or Inhalation use**

6.18 Radiopharmaceuticals prepared for administering by mouth or by inhalation, require the appropriate general pharmaceutical standards of facilities for such preparations. (Chapter 5) Materials which are volatile or gaseous should be prepared in a fume cupboard in an unpressurized area. Should it be necessary to site a facility for handling volatile radiopharmaceuticals in an aseptic room, a down-draught workstation with a total exhaust system may be used. In these circumstances additional air flow will be needed to compensate for the drop in pressure in the room if the overall pressure is to be maintained.

# 7 Other General Functional and Design Considerations

## Introduction

7.1 This Chapter contains guidance concerning aspects of function and design which are common to health buildings generally and which will need to be borne in mind when designing new buildings or up-grading existing premises.

## Statutory and other requirements

7.2 It is Government policy that health buildings should comply with the technical requirements of all relevant statutes and regulations though at the time of writing not all the procedural requirements of such legislation are enforceable against health authorities as Crown bodies. Attention is particularly drawn to HC(86)14 (WHC(87)7 in Wales), relating to Food Hygiene and Pest Control in the Health Service, and HC(87)3 (WHC(87)8 in Wales), which give the practical implications of the change in the law on Crown Immunity. This guidance takes account as far as possible of all statutory and all other requirements currently in force but, nevertheless, health authorities are reminded of their responsibility for ensuring compliance with statutes, regulations, codes and standards.

## Fire precautions

7.3 It is essential that project teams familiarise themselves with the guidance contained in the FIRECODE series of documents which together give the Department's policy and technical guidance on fire precautions in hospitals and other NHS premises. In particular, the need for structural fire precautions and means of escape from the whole accommodation must be taken into account at the earliest possible planning stage. The key document for these aspects in hospitals is FIRECODE: "Fire Precautions in new hospitals", Health Technical Memorandum 81.

7.4 In addition, basic policy, principles and key management guidance are contained in FIRECODE: "Policy and Principles". Other FIRECODE documents include the Health Technical Memoranda '80' series (which give technical guidance on various building, engineering and equipment issues), the Fire Practice Notes series (dealing with various specialist aspects of fire precautions) and Nucleus guidance. Existing HTMs will, in due course, be reissued in FIRECODE format. The series includes FIRECODE: "Directory of Fire Documents" which lists references to relevant legislation and fire precautions guidance issued by DHSS and others, for example, the Home Office. FIRECODE and publications in the HTM '80' series are listed in the Bibliography at the end of this Note.

7.5 During the design stage it is important to establish those aspects of fire safety strategy which affect the design, configuration and structure of a project. At appropriate stages of the design process the architect and engineer should discuss and verify their proposals with the local fire authority, and ensure that the project team and all other planning staff are fully acquainted with the fire safety strategy for the design in terms of operation (staff responsibilities etc), equipment provision, and building and engineering layouts. Health Technical Memoranda 57, 58 and 59 give detailed information on the selection of fire resisting components.

7.6 The principles of fire safety apply to new projects and to alterations and upgrading of existing buildings.

7.7 Parts of a pharmacy may be classified as 'high fire load' and should therefore be located to give good access for fire-fighting apparatus. The need for segregated storage of flammable materials is referred to in paragraph 4.64.

## Economy

7.8 The planning of hospital buildings requires design solutions which not only satisfy functional requirements but also ensure maximum economy in respect of both capital and running costs. Due weight must therefore be given to the questions of space provision, maintenance (including cleaning), energy consumption and staffing requirements.

7.9 Planning should ensure that spaces are used as intensively as possible and are not unnecessarily duplicated. Economical space provision can be achieved in the following ways:

a. by planning for spaces to be used more intensively for a particular purpose. This means that the amount of space for a service or a group of services should be no more than is needed for the anticipated workload, staffing levels and available revenue allocation, and that spaces should be used more, where possible, by different users of the same specialty;

b. by planning for spaces to be used for more than one function or purpose. This means reducing the specialised nature of the accommodation when possible, so that its use by various people for various purposes is not unduly restricted or precluded.

7.10 To ensure that there is no over-provision of new accommodation, project teams should first evaluate the utilisation of similar existing facilities in relation to their workload and staffing.

## Upgrading or adaptation of existing buildings

7.11 The standards set out in this guidance essentially apply to the provision of accommodation by new building and it is not intended that they should be applied retrospectively to existing stock. However, the principles are equally valid and should be applied, so far as is reasonably

practicable, when existing accommodation is being upgraded or new accommodation is being constructed within an existing building which may previously have been used for other purposes.

7.12 The cost of upgrading work should conform to the guidelines indicated in the Department's WKO letter (81)4, (AWO(81)8 in Wales) issued on 24 July 1981. Those guidelines take into consideration the estimated life of the existing building and the difference in cost between upgrading a building and new building.

7.13 Before any decision is made to carry out an upgrading project, consideration must be given to the long-term strategy for the service, the space required for the new service, and the size of the existing building. Regard must also be paid to the orientation and aspect of the building and the adequacy and location of all necessary support services. If there emerges a prima facie case for upgrading, a thorough analysis of all functional and physical conditions of the existing building should be undertaken.

7.14 When comparing the cost of upgrading or adapting an existing building with that of a new building, in addition to the building cost due allowance must be made for the cost of relocating people, demolition and salvage costs, disruption of services in a phased project, and the temporary effects on running costs of any impaired functioning of areas affected by upgrading. Nor must the guidance given in Appendix 2 be overlooked in relation to manufacturing units.

**Component Data**

7.15 The Component Data Base (Mark 3) contained specifications, design guidance and lists of selected components or firms producing selected components for use in health buildings, but has now been replaced by a series of Health Technical Memoranda (see Bibliography) which provide specification and design guidance on building components for health building which are not adequately covered by current British Standards. No firms or products are now listed.

**Critical dimensions**

7.16 The figures in Appendix 3 contain information on critical dimensions for some of the activities mentioned in this Note which are not included in the 'Common Activity Spaces' Building Note, HBN 40.

**Smoking**

7.17 Health Circular HC(85)22 dated May 1985 - WHC(85)31 dated July 1985 in Wales - reviews the problems presented by smoking in health buildings, and while recognising that the responsibility for making rules rests with the health authority, recommends that smoking should be confined to specially designated areas such as the staff room and the patient waiting areas of the pharmacy. In such areas ventilation should be sufficient to prevent discomfort to non-smokers and the spread of odours to other areas of the premises.

**Maintenance and Cleaning**

7.18 Materials and finishes should be selected to minimise maintenance and be compatible with their intended function. Building elements that require frequent redecoration or are difficult to service or clean should be avoided. Special design consideration should be given to elements such as entrances, corners, partitions, counters and any others which may be subjected to heavy use. Floor finishes should be restricted in variety and, where soft floor coverings are specified and spillage is anticipated, should have a backing impervious to fluids and a non-absorbent pile. Wall coverings should be chosen with cleaning in mind.

7.19 Health Technical Memoranda 56, 58 and 61 give guidance on these aspects for partitions, internal doorsets and flooring.

**Damage in health buildings**

7.20 When designing and equipping health buildings, the likely occurrence and effects of accidental damage should be considered. Damage in health buildings has increased over the years due to the use of heavier mechanical equipment for the movement of patients and supplies and, to some extent, as a result of lighweight, often less robust, building materials. Most damage to doors, and to floor and wall surfaces, is caused by wheeled traffic. Measures to minimise damage should be taken in the form of protective corners, buffers and plates, and to proper continuation of floor surfacing ie strong screeds and fully bonded floor coverings. Protective devices should be capable of being renewed as need arises. Reference should be made to the relevant British Standards, to the advice in the Department's DS (Supply) letter 42/75 dated 5 August 1975 on the buffering of movable equipment, and to the guidance contained in Volume 2 of HBN40 "Common Activity Spaces". Further information is provided in Health Technical Memoranda 56, 58 and 61.

**Education and training**

7.21 Although education requiring special facilities will take place in the district's education centre, some teaching has to take place in the department. Apart from the use of seminar rooms, no special facilities are normally required elsewhere.

7.22 The requirements of students in training will need to be taken into account, and the appropriate people and/or bodies should be consulted at the initial planning stages.

7.23 Reference should be made to the Department's letter DS 65/74 about teaching hospital space requirements, issued March 1974. (In Wales, reference should be made to letter HSD 3/57/1 dated 29 April 1974).

**Disabled People**

7.24 It is essential to ensure that suitable access and facilities are provided for disabled people who have problems of mobility or orientation. This includes, besides the wheelchair-bound, those who for any reason have difficulty in walking and those with sensory handicap such as a visual or hearing impairment. Authorities are reminded of the need to comply with the provisions of the Chronically Sick and Disabled Persons Act 1970 as amended by the Chronically Sick and Disabled Persons (Amendment) Act 1976, the Disabled Persons Act 1981, and, the Building Regulations 1987 Schedule 1. Attention is also drawn to BS 5810:1979 "Access for the Disabled to Buildings". One of the effects of the 1981 Act is to

apply this British Standard to premises covered by the 1970 Act, which includes those open to the public. Compliance with the British Standard will also met the 'deemed to satisfy' provisions of Schedule 1 of the Building Regulations 1987 in terms of design.

**Signposting**

7.25 Signposting should form part of the whole hospital policy and be in accordance with the Department's signposting manual, HTM 65, "Signs".

# 8 Engineering Services

8.1 This chapter describes the engineering services contained within this department and their integration with the engineering systems serving a whole site. Its purpose is not to inhibit the design solution but to acquaint the engineering members of the multi-disciplinary design team with the criteria adopted (in terms of material specification, design conditions and reference material) to meet the functional requirements.

8.2 Documents referred to by number viz[10] are listed at the end of the chapter. They are numbered in order of first appearance, repeated reference retaining the same number.

**Pharmaceutical requirements**

8.3 Whilst the requirements for heating, lighting and power installations in this department will not differ significantly from the conventional the application of the Medicines Act to hospital pharmacies will have an influence on four aspects of the engineering design, namely the provision of:

i. an adequate supply of quality monitored distilled water;

ii. a controlled environment in areas used for the preparation of sterile products;

iii. contained workstations for operator and/or product protection;

iv. facilities for product sterilization.

The Medicines Act contains in effect a requirement for an adequate system of quality assurance and detailed guidance concerning environmental criteria necessary to meet this requirement is given in the "Guide to Good Pharmaceutical Manufacturing Practice" (the "Orange Guide").[1]

**Model specification**

8.4 The library of standard specifications previously issued as a series of engineering data sheets has been updated and issued as a model specification for engineering services in health care buildings. The cost allowance for the engineering services in each functional unit of this department is based on qualities of material and standards of workmanship described in the model specification.

**Economy**

8.5 Engineering services should be designed to obtain the optimum benefits from the capital invested. Where alternative design solutions are available their consequential capital and running costs should be compared using Present Worth techniques[2] due consideration being given to the need for access for maintenance and the replacement of plant and equipment.

8.6 The economic appraisal of alternative design solutions should include the heat conversion and distribution losses at the point of use. Where buildings are located remote from the development's load centre these losses can often equal the useful energy consumed.

8.7 In the interest of energy management, facilities for the temporary installation of metering for all services should be provided at main intake points to this department. HSE Data Sheet DR6[3] gives information on the selection and use of metering equipment.

8.8 After satisfying the Building Regulations[4] on the standards of thermal insulation provided, consideration should be given to the economics of additional insulation to the ground floor slab and to the roof (Engineering Data Sheet CE7[5] refers) particularly where accommodation is located in a building of low rise construction. Where there is a solidly constructed ground floor, the inclusion of floor insulation will also contribute to staff comfort. Guidance concerning the economic thickness of thermal insulation relative to the cost of energy, 'K' values, temperature differences, capital costs and hours of use is given in Engineering Data Sheet CE11.[6]

**Space requirements for services**

8.9 The satisfactory performance of plant in this department is particularly important and the design should allow for ease of access and space for the necessary frequent inspection and maintenance. As far as practical this access should be from outside areas which are clean or sterile.

8.10 Recommended spatial requirements for mechanical, electrical and public health engineering services in health buildings are given in HTM23.[7] The information in this publication is specifically intended for use during the initial planning stages when precise dimensional details of plant are not available.

8.11 The distribution of mechanical and electrical services to final points of use should be concealed wherever possible employing a ceiling void and a 200 mm wide perimeter zone under window sills. Heat emitters should be contained within the latter and critical dimensions should be taken from the boundary of this zone. For costing purposes the 200 mm band includes the floor area occupied by minor vertical engineering ducts and is included in the building circulation provision. Services above clean and sterile areas should be confined to those required for the particular areas beneath.

**Activity data**

8.12 User requirements, environmental conditions and equipment arrangements, as described in the Activity

Data sheets listed in Chapter 10 should be referred to when positioning service components and outlets.

**Control access**

8.13 The location of primary engineering distribution control and isolation devices should be protected against unauthorised use, eg concealing switchgear and fuseboards in secure cupboards. They should also allow easy access from circulation rather than working areas.

**Safety**

8.14 Section 6 of the Health and Safety at Work Act 1974[8] imposes statutory duties on all persons who design, manufacture, supply, install or erect "articles" for use at work, to ensure as far as is reasonably practicable that such articles are safe and without risk to health when properly used. Engineering systems such as pipework, terminals etc are covered by the term "articles" and thus these duties apply to the designers of engineering services for non-domestic buildings.

**Noise**

8.15 Excessive noise in individual areas, whether internally or externally generated and transmitted, can adversely affect the operational efficiency of the department. The means of control advocated in Hospital Design Note 4[9] including its revisions[10] and Engineering Data Sheet DH1[11] should provide an acceptable acoustic environment. Care is required to ensure that there is auditory privacy in offices of senior supervisory staff.

8.16 Extract systems serving contained workstations are potentially the most dominant source of noise generation and require judicious selection of fans and aerodynamically efficient workstations to ensure that noise levels are kept within acceptable limits. The problems associated with contamination and corrosion usually preclude the use of sound attenuators.

**Engineering Commissioning**

8.17 It is most important that engineering services should be fully commissioned. HTM No 17[12] describes the requirements which should be included in the design and building contract documents. Flow measurement and proportional balancing of air and water systems require adequate test facilities eg orifice plates, venturi valves etc, to be incorporated at the design stage.

**Fire safety**

8.18 Design guidance relative to the fire safety requirements in new hospitals is given in HTM 81.[13] Technical information concerning the design and specification of fire detection and alarm systems is detailed in HTM 82[14] which also replaces or modifies certain clauses of BS 5839[15] Part 1 to meet the needs of health care premises. More general advice on fire protection including the storage of flammable substances is given in HTM 83.[16]

8.19 The design of the engineering services should accord with the recommendations in the above series of HTMs and the engineer should verify his proposals in accordance with the procedure described in paragraph 7.5.

**Maximum demand**

8.20 User demand on engineering services is often difficult to predict but experience indicates that services designed for simultaneous peak load conditions are seldom fully utilised in practice. The estimated maximum demand and storage requirement (where appropriate) for each engineering service in this department will need to be assessed individually to take account of building shape, geographical location, operational policies and functional needs. As a guide and for preliminary planning purposes only, the following are the estimated maximum demands for a pharmaceutical department providing primary services for a 600 bed hospital. (Para 4.4)

| *Service* | *Typical Maximum Demand* | *Notes* |
|---|---|---|
| Heating ventilation DHWS (kW) | 150 | |
| Domestic HWS (litre/sec) | 0.75 | 2 hour recovery |
| Cold water (litre/sec) | 0.9 | 24 hour storage |
| Supply ventilation ($m^3/s$) | 1.02 | |
| Extract ventilation ($m^3/s$) | 0.8 | Clean and dirty |
| Electrical (kVA) | 10 | Essential 4.2 kVA |
| Gases | | |
| Compressed air (litre/min) | 50 | |
| Vacuum (litre/min) | 40 | |
| Natural (fuel) (litre/min) | 6.0 | |

## MECHANICAL SERVICES

8.21 The mechanical services include the provision of heating, ventilation, hot and cold water supplies, medical gases, steam and condensate, and fire mains. Sterilising, distillation, washing/drying and other specialised equipment will also be required. For cost allowance purposes the distribution of these services is deemed to commence at their point of entry into the accommodation and includes pipework, fittings, controls and connections to equipment and outlets.

8.22 For environmental requirements in individual spaces, reference should be made to the Activity Data sheets. Recommended room temperatures, air change rates, hot water service temperatures etc are grouped under 'Technical Design Data' on each 'A' sheet. The 'B' sheets give the disposition of engineering outlets for the activities described.

**Space Heating**

8.23 Except in clean and aseptic areas general space heating requirements can be met by a low pressure hot water system using radiators or natural convectors. The surface temperatures of heat emitters must not exceed 82°C.

8.24 Heat emitters should normally be located under windows or against exposed walls, with sufficient clear space between the top of the emitter and the window sill to prevent curtains or blinds reducing the output, and adequate space below to allow cleaning. Where an emitter is located on an external wall, back insulation should be provided to limit the rate of heat transmission through the building fabric. Information regarding the construction of heat emitters including their mechanical and thermal characteristics, methods of mounting and fixing, variations in pipe connections, problems of cleaning and maintenance, control of output and aspects of safety are given in Engineering Data Sheet DN4.[17]

### Temperature Controls

8.25 To facilitate overall temperature control the heating system should normally be controlled via an external compensator and if practicable zoned relative to each major elevation of the building. Where overheating in individual rooms is likely to occur, eg solar gain or where for functional reasons variable room temperatures are required, thermostatic radiator valves should be installed. These valves should be of robust construction and selected to match the temperature and pressure characteristics of the heating system. The thermostatic head incorporaing a tamper-proof facility for presetting maximum and minimum room temperature should be controlled via a sensor located integrally or remotely as appropriate. Where space is restricted or heat gains and/or losses are particularly variable consideration should be given to the provision of thermostatically controlled fan-convectors fitted with low-limit control.

8.26 Where practicable the heating system should be clock-controlled and programmed to accommodate the working hours of the unit. The control system, possibly incorporating an optimum-start device, should be used to set-back the space temperature to an anticondensation level of approximately 10°C when the accommodation is closed (actual set-back to be determined from local trials). To allow for occasional abnormal hours of working, a conveniently sited time-restricted manual over-ride switch should be included to extend the normal heating period.

### Ventilation

8.27 The department, except for clean or aseptic areas and those areas where fume cupboards/canopies are installed, should be designed for natural ventilation and particular attention should be given to the type of windows selected, to allow air infiltration without draught. Openable lights should be provided which allow optimum seasonal ventilation without prejudicing safety, security or comfort.

8.28 It is acknowledged that planning constraints imposed by the building shape and/or functional relationships of specific areas will invariably result in some measure of deep planning. Ventilation costs can, however, be minimised by ensuring that wherever practicable core areas are reserved for rooms that require mechanical ventilation irrespective of their internal or peripheral location. Examples are: where fume cupboards are installed, sanitary facilities, and those rooms whose functional requirements have specific environmental needs and where for reasons of security, sterility or absence of solar gain, etc, windowless accommodation is acceptable. Other spaces appropriate to core areas are those which have only transient occupation and therefore require little or no mechanical ventilation. Examples are circulation and storage areas.

8.29 In addition to the ventilation system associated with the sterile suites (para 8.35) extract systems will also be required for fume cupboards/canopies and also to maintain acceptable environmental conditions in other specific areas.

### Fume Cupboards

8.30 The factors which affect the performance of fume cupboards include an adequate volume of supply air and an effective exhaust system that allows the safe dispersal of waste products to atmosphere. The air velocity through sash openings must be sufficient to prevent hazardous materials from entering the laboratory whilst avoiding excessive flow rates that interfere with the investigation in progress. Average face velocities should be between 0.5 and 1.0 metres/sec with a minimum at any point within 20% of the average, the upper end of the range being applicable to the containment of materials of high toxicity. The design velocity must be maintained irrespective of whether the sash opening is varied or whether doors and windows are open or closed. Further detailed guidance concerning the selection and installation of fume cupboards is given in Health Equipment Information No 86.[18]

### Extract canopies

8.31 Extract canopies will be required over steam and heat-emitting equipment eg sterilizers and container washing equipment and also over benches used for mixing, sifting and blending procedures. The airflow rate must be sufficient to ensure an adequate capture velocity in the vicinity of the process and a minimum canopy face velocity of 0.2 metres/sec will normally be required. A compact arrangement of equipment (but with access for maintenance) will minimise the canopy area and hence reduce the air volume necessary to achieve the optimum capture velocity.

### Sanitary facilities

8.32 A separate extract system will be required for sanitary facilities using dual motor/fan extract unit with automatic changeover to ensure that these rooms are always maintained at a negative pressure while the unit is in use.

### Supply air, make-up and re-circulation

8.33 Ventilation supply plant should incorporate air filters of 95% efficiency against BS 2831[19] Test Dust No 2. Filters must be readily accessible for replacement and provided with a pressure differential indicator; coarse prefilters may be justified where the intake air is exceptionally polluted. Heater batteries should be sized for the ventilation requirements only ie not the fabric loss. The extract systems associated with fume cupboards and canopies will require a substantial volume of suitably filtered and tempered supply air. Air movement induced by mechanical ventilation should be from clean to dirty areas where these can be defined, with diffusers and grilles or workstation extracts located to encourage uniform air movement within the space. The design should allow for an adequate flow of air into each space, either from the air supply system, or through grilles in doors or walls from adjacent spaces or corridors. Such arrangements, however, should avoid the introduction of untempered air, and should not prejudice the requirements of fire safety, security or privacy.

8.34 Air extracted from areas containing cytotoxic and/or radiopharmaceutical safety cabinets may be combined with air extracted from other clean areas and recirculated. The deficit, due to air extracted through safety cabinets and the like and discharged to atmosphere, should be replaced by treated fresh air. Additional fresh air may be required to provide adequate occupant ventilation. To

cope with the risk of an accident or spillage outside safety cabinets, a 'panic button' should be provided. Its function is to switch off the air supply to that space whilst providing extract ventilation only. The controls should provide for all air extracted from the department under these circumstances to be discharged to atmosphere. The Health and Safety Executive's requirements in these areas remain to be established and they must be consulted on this aspect at the design stage of all projects.

**Sterile Suites**

8.35 Designated areas for sterile manufacturing and dispensing operations including the manipulation of radiopharmaceuticals require environments that meet the standards previously referred to in Chapters 4, 5 and 6. Note that neither laminar flow conditions for Class 1 or 2 spaces nor airlocks for Class 3 or 4 spaces are considered necessary, but these areas should comply in all other respects with BS 5295.[20] Doors at either end of airlocks should not be interlocked but an indicator system is recommended. Pass-through hatches should observe similar criteria, but they may be interlocked to ensure the retention of air pressure. The design parameters for ventilation systems in these areas will include elimination of particulates shed by operatives, internal heat gains, room pressure differentials and the minimum number of air changes recommended in the standards. Protective and often restrictive clothing and headgear will be worn and therefore operator comfort is also an important consideration.

8.36 Products which are sterilized by heat in their final containers must be prepared in a 'clean' area which is defined in the Orange Guide[1] as a Class 2 environment in accordance with BS 5295.[20] When an already sterile product requires further processing this must be undertaken in an 'aseptic' area which is defined in the Guide[1] as a Class 1 environment in accordance with the BS 5295.[20] To achieve these standards the supply air system should incorporate BS 3928[21] filters of 99.97 efficiency in clean areas and 99.997 efficiency in aseptic and changing areas. They must be readily accessible for replacement and provided with a pressure differential indicator with remote readout in the entrance to the suite. Pre-filters (efficiency 95%) will extend the life of high efficiency particulate air (HEPA) filters and may be justified where the intake air is exceptionally polluted.

**Contained workstations**

8.37 These are located in clean and aseptic areas to provide extra protection at the point of handling. There are two categories of contained workstations required in hospital pharmacies. The first is a clean air process cabinet used in the clean area for the preparation of parenteral admixtures and to protect some filling operations or other processes where the ingredients being handled are non-toxic. The air supply to the workstation should be unidirectional (laminar flow) with BS 5295[20] Class 1 standards of filtration (99.997%). An air velocity of 0.5 metres/sec across the face opening should be adequate to ensure that any particles shed by the operator are carried away from the process. Further detailed information concerning the selecion and installation of laminar flow workstations is given in Hospital Equipment Information No 67.[22]

8.38 A second category of workstation will be required where a pharmaceutical department undertakes the preparation of products whose toxicity is accumulative and are therefore hazardous to staff eg cytotoxic agents or radiopharmaceuticals. It should comprise a BS 5726[23] Class 2 exhaust protective cabinet with Class 1[20] vertical airflow at the working surface and an adequate inward airflow at the cabinet face for containment. The preparation of radiopharmaceutical products should be undertaken in a dedicated cabinet housed in a separate designated area. Each protective cabinet must have its own individual exhaust system incorporating effective precautions against blow-back and providing safe dispersal to atmosphere. Further detailed information concerning selection and installation is given in Hospital Equipment Information No 86[24] and (for cytotoxic drugs) in HSE Guidance Note MS 21.[25]

8.39 The ventilation systems in clean and aseptic areas and the airflow through protective cabinets should be designed for continuous operation and should only be shutdown for the purposes of maintenance or emergency isolation. Protective cabinets should be provided with a visual indication of airflow and with the minimum safe airflow clearly shown. There should also be an audible and visual warning if the flow falls below the safe level or if the general ventilation supply or extract fans fail.

**Heat recovery**

8.40 As part of a whole hospital energy strategy consideration should be given to the recovery of heat extracted from the department where this is economic and where no toxic or corrosive substances are carried in the extract air. Although substantial energy expenditure is incurred in tempering air exhausted through fume cupboards and protective cabinets heat reclamation should not compromise laboratory ventilation requirements or the free flow of air through enclosures.

8.41 Condenser cooling water used in the distillation process should be utilised to preheat domestic hot water services where it is convenient and economic to do so.

**Hot, cold and drinking water services**

8.42 The domestic hot water supply should be taken from the general hospital installation at a temperature which allows water at 60°C to be available at all outlets. Outlet fittings for sinks and wash basins are shown on Activity Data 'B' sheets. In dispensing areas, outlets should be fitted with bottle filling nozzles or hose connections located over the centre of sinks at a minimum clearance height of 550 mm and should incorporate precautions against back siphonage.

8.43 Guidance concerning the design and installation of cold water supply pipework and distribution systems is given in HTM 27.[26] For frost protection purposes and to prevent condensation staining the decorative finishes, all cold water pipework, valves and flanges should be insulated and vapour sealed.

8.44 The cold water supply for dispensing purposes and to distillation plant should be taken direct from the supply

undertaking's mains. Where fully potable cold water systems are not provided, a drinking water tap should be provided in the toilets and the staff room. The supply to these should be direct from the mains or from a protected tank.

**Distilled water**

8.45 Distillation is the recommended purification process to remove any bacteria viruses and pyrogens contained in raw mains feedwater. Pretreatment of water in hard water areas will be required. As previously referred to in paragraph 5.35 distilled water will be required in quantity for product preparation in sterile and non-sterile areas and also for cleaning purposes eg bottle washing. Plant capacity will depend upon local aggregate demand for freshly distilled water and that drawn from temperature controlled storage but a delivery rate in the range 50–150 litres/hour with a storage capacity of 100–300 litres will normally be adequate. Plant and distribution pipework should be robust, inert and easily maintained. For sterile manufacturing a recirculatory system is recommended with duplicate pumps to ensure continuous operation. Instrumentation should include facilities for recording distillate temperature, flow and conductivity.

8.46 The production of purified water by condensing steam from a hospital central steam generation plant is not recommended. It has the disadvantage that chemicals used for raw feed water treatment together with inhibitors and possibly oil are potential contaminants that could be carried over to the distilled water circuit.

**Steam supply**

8.47 Where available the hospital central steam generation plant may provide an economical source of primary heat for sterilizers, distillation plant and container washing equipment. A mains pressure of 4 bar will be required for sterilizers with other equipment supplied via reducing valves as appropriate.

**Sterilizers**

8.48 Detailed guidance concerning the selection, installation and commissioning of bottled fluids sterilizers and electrically heated sterilizing ovens (hot air sterilizers) is given in HTM 10.[27] Whilst the scale of provision will be variable and influenced by local factors eg scale of manufacturing operation, clinical specialties served etc, continuity of production is important. Selection of type and capacity of sterilizing equipment should therefore include sufficient diversity to enable a standby service to be maintained.

8.49 Sterilizers will normally be of the built-in type with only the loading doors, controls and instrumentation accessible to the operatives, sterilizing chambers being concealed within the plant room; the mounting height should be arranged to suit that of the loading trolley. Adequate access must be provided in the plant room for the engineer to carry out inspection and maintenance routines and replacement of plant.

**Gas services**

8.50 The bench services required are indicated on activity data sheets and normally comprise: compressed air at maximum gauge pressure 3 bar; vacuum at 400 mm Hg below standard atmospheric pressure; natural gas (fuel) at normal mains pressure (20 mbar). Small quantities of other gases may be required eg nitrogen which will normally be supplied from portable cylinders. Guidance concerning the storage of medical and industrial gas cylinders including the requirements for main cylinder storage areas is given in HTM 22.[28]*

8.51 To avoid the risk of contamination, bench services should be supplied from compressor and vacuum plant provided exclusively for this department. Terminal outlets should comprise suitable valves clearly identified using appropriate colours and lettering. Outlets within contained workstations should be controlled by easily accessible valves located outside the work area.

**Flammable stores**

8.52 In addition to the general guidance given in HTM 83[16] a Fire Precautions Note FPN2,† deals specifically with the requirements for the safe storage of flammable liquids.

**Fire-fighting equipment**

8.53 Fire-fighting equipment should consist of hydraulic hose-reels and portable fire extinguishers, and should be positioned so that adequate cover is given to the whole interior of the department. Hose-reels in accordance with BS 5306 Part 1[29] and usually with 30 m of hose, should be located so that the jet of water from the fully extended hose is capable of reaching every point on the floor area without interruption after due allowance is made for furniture and fittings. In addition to hose-reels 9 litre water extinguishers should be provided on the basis of one extinguisher per 200 $m^2$ of floor area with a minimum provision of two extinguishers per fire compartment. Carbon dioxide extinguishers should be provided to cover electrical risks but for other risks, eg ignited liquids or gas, either carbon dioxide or dry powder extinguishers are appropriate. Extinguishers should comply with BS 5423[30] and further guidance concerning their selection and use is given in HTM 81.[13]

## ELECTRICAL SERVICES

8.54 The electrical installation will include main intake switchgear and wiring and equipment for lighting, power, and environmental plant. Extensions from the hospital central systems for telephones (conduits only), fire alarms and staff location services, together with a security system for controlled drugs will also be required. These installations should comply in all respects with the current Regulations for Electrical Installations[31] and conform to the requirements of HTM 7.[32] Reference should be made to the Activity Data sheets for the recommended levels of internal illumination, disposition of outlets for power, telephones and clocks etc in individual spaces.

8.55 The point of entry for the electrical supply will be a departmental switchroom housing the main isolator and the main distribution equipment. The switchroom will also be the distribution centre for subsidiary electrical services and, wherever possible, all equipment should be mounted at a height to give easy access from a standing position.

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***revision in preparation**

**†This document was published under cover of HC(87)24, Fire Precautions in NHS Premises – FIRECODE.**

The switchroom should be positioned so as to minimise the cost of cabling required to serve the accommodation.

**Electrical installation**

8.56 The electrical installation in occupied areas should be concealed using PVC insulated cable in screwed steel conduit, or trunking. External installation or any part within the building subject to external conditions, should comprise PVC insulated cables in galvanised screwed steel conduit with fittings of weatherproof pattern. Steel conduit and trunking wiring ways for communication systems should also be concealed wherever possible.

**Electrical interference**

8.57 The avoidance and abatement of electrical interference should be undertaken as advised in HTM 14.[33]

**Lighting**

8.58 Lighting should follow standard modern practice and the choice of luminaires (lighting fittings) should take account of the requirements of distribution, glare and cut-off appropriate to the space. Luminaires should be fitted with fluorescent lamps where artificial lighting is required for long periods, and in all working areas. Intermittently used luminaires may be fitted with incandescent or compact fluorescent lamps. Luminaires should be of a type which is easily cleaned and maintained and located where readily accessible for lamp changing and maintenance.

8.59 It is essential that fluorescent lighting in all areas where medicines or containers are processed, including stores, is derived from one of the recommended types of lamps having suitable colour rendering characteristics.[34] In such areas the colours chosen for walls, floors and ceilings should be carefully selected; architects and engineers should collaborate to ensure that the decorative finishes are compatible with the colour rendering properties of the lamp and that spectral distribution of the light source is not unduly altered.

8.60 Control of lighting is normally by local switches and these should be provided in sufficient numbers to allow variation in lighting options eg reduced levels of illumination when circumstances permit, and to encourage energy conservation. This is particularly relevant in rooms where, because daylight is restricted, supplementary artificial lighting is required for long periods in areas remote from windows.

8.61 Lighting switches in clean or aseptic areas should have front plates flush with the wall surface with no projecting ledges.

8.62 In clean or aseptic areas, luminaires should be of the recessed type with the diffuser flush with the ceiling. The luminaires should be of the 'sealed' type and should be arranged to enable relamping from outside the area (ie from the ceiling void above) if possible.

8.63 In areas where there are fixed workbenches or externally illuminated fume cupboards luminaires should be located to illuminate task areas without casting shadows.

8.64 Corridors and other circulation areas should be illuminated in accordance with the recommendations given in HBN 40 Vol 2.[35]

**Socket outlets**

8.65 Sufficient 13A universal type switched, shuttered socket outlets connected to ring or spur circuits should be provided to allow each portable appliance likely to be used at the same time to be supplied from a separate outlet.

8.66 For bench services in the dispensing and quality control areas, and to a lesser degree in the manufacturing areas, an above-average provision of socket outlets will be required. To give flexibility and allow for the repositioning and addition of outlets with minimum disturbance, a socket outlet trunking system can be advantageous.

8.67 Fixed equipment rated up to 13A should be permanently connected to spur boxes and fused as required. Equipment rated in excess of 13A should be fixed and permanently connected to separate final circuits and be independently switched.

8.68 Indicating lights to show when the electrical supply is switched on should be incorporated in socket outlets and fused spur boxes in all the work areas.

8.69 Additional socket outlets should be provided as necessary throughout the department, including corridors, to allow for the convenient use of domestic cleaning appliances having a flexible lead assumed to be 9 m long.

**Emergency electrical supplies**

8.70 Guidance concerning the provision of emergency electricity supplies is given in HTM 11,[36] and the grade of standby lighting provision is shown on the Activity Data 'A' sheets. Safety lighting in accordance with HTM 11[36] and BS 5266[37] should be provided on primary escape routes.

8.71 All socket outlets in dispensing areas and electrical supplies to sterilizers, distillation plant, contained workstations and drug stores including alarm and control systems should be supplied from essential circuits.

**Telephones and Communications**

8.72 Telephones will normally be extensions from the main hospital switchboard. In addition an inter-communication system between the entrance lobby and other rooms in clean and aseptic areas will be required. Wall mounted instruments in work areas are advantageous.

**Staff location system**

8.73 Where the accommodation is associated with other hospital departments having a staff location system, extensions thereto will be required. Guidance on staff location systems is given in HTM 20.[38]

**Electrical clocks**

8.74 Clocks should operate in conjunction with a master clock system. If such a system is not available synchronous clocks should be installed using a common clock circuit suitable for future connection to a master system. The number of clocks provided should be kept to the minimum and they should be installed only in circulation areas.

**Pharmacy Security**

8.75 Drugs liable to misuse are required to be stored in secure cabinets or stores protected by a security alarm

system. DHSS has arranged for manufacture of a recommended cabinet and alarm system, details of which are available to authorised designers.

8.76 It is not normal practice to install general intruder alarms in pharmacy departments but access should be restricted to authorised personnel using a security locking system or magnetic card keys.

### Lightning protection

8.77 Protection against lightning should be provided in accordance with HTM 7[32] and HSE Data Sheet DB 2.[39]

### Plant rooms and ducts

8.78 Electrical services in communication spaces such as plant rooms, service ducts and voids should include a good standard of lighting for access and maintenance of plant and adequate socket outlets for use of portable tools and lamps which will operate at 110V through their own portable transformers. Plant rooms and access points to major ducts should be provided with a telephone, preferably wall mounted and connected to the hospital internal system only.

### Internal Drainage

8.79 The primary objective is to provide an internal drainage system that uses the minimum of pipework and remains water and air-tight at joints and connections, but is sufficiently ventilated to retain the integrity of water seals.

8.80 General design guidance is given in the relevant British Standards and Code of Practice including BS 5572[40] - formerly CP 304, and the current Building Regulations.[4] Recommendations regarding spatial and access requirements for public health engineering services are given in HSE Data Sheet EA5.[41]

8.81 The gradient of branch drains should be uniform and adequate to convey the maximum discharge to the stack without blockage. Practical considerations such as available angles of bends/junctions and their assembly, as well as space considerations, usually limit the minimum gradient to about 1:50 (20 mm/m). For the larger pipes, eg 100 mm diameter, flatter gradients can be used but require workmanship of a high standard if adequate self-cleansing flow is to be maintained. It is not envisaged that pipes larger than 100 mm diameter will be required within inter-floor or ground floor systems serving this accommodation.

8.82 The system should be designed to avoid the use of internal manholes, and access points for pipework cleaning should be located to minimise disturbance to staff in the event of a blockage.

8.83 To prevent the ingress of bacteria the waste outlets from sterilizers, distillation plant, glassware washing machines and refrigerators should not be directly connected to the drainage system but should discharge via a trapped tundish or gully.

8.84 In situations where the effluent contains corrosive or toxic substances the local authority should be consulted before any connection is made to the main drainage system. The pipework materials should be carefully selected and be resistant to attack from the media being discharged and have a smooth internal finish.

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# 9 Cost Information

9.1 For all types of health buildings it is clearly of vital importance that building costs and revenue expenditure should be kept as low as possible consistent with acceptable standards. Within this general context building notes provide a synopsis of accommodation for health buildings which the Department, in conjunction with the National Health Service, recommends for the provision of a given service.

9.2 In applying the guidance in this Health Building Note to determine the detailed design of a project, the need for economy should always be of prime concern and the activities should be carefully considered so that, where appropriate, space can be shared for similar activities or programmed for the activities to take place at different times. The solution should not be detrimental to the proper functioning of the spaces involved nor to the needs of patients or staff.

**Works Cost**

9.3 To prepare an estimate of the works cost for a scheme, reference should be made to the Capricode Health Building Procedures Manual. (Chapter 1, Stage 1, Annex 1.c). The total Departmental Cost Allowance (DCA) for a scheme is derived by aggregating the cost of the functional units, Essential Complementary Accommodation and Optional Accommodation and Services as appropriate to the particular scheme.

9.4 The Works Cost covers the building and the engineering requirements set out in this Note. In the costing of the functional units it has been assumed that the Primary Services will be incorporated into a hospital and that the other services will be constructed as an independent unit either detached or incorporated into a peripheral zone of industrial premises.

9.5 The functional units in this Note are:

***Primary Services***

| | |
|---|---|
| In-patient services | - 450-600 beds |
| | - 600-1,200 beds |
| Sterile suite | - small |
| | - large |
| Out-patient services | - attached |
| | - remote |
| Drug Information | - hospital level |
| | - district centre |

***Pharmaceutical Support Services***

Sterile Manufacture
Non-sterile manufacture
Assembly
Quality Control
Purchase and Distribution

***Radiopharmaceuticals Preparation***

Closed procedures unit
Open procedures unit

Schedules of activity spaces for each function are provided at the end of this chapter.

**Essential complementary accommodation (ECA)**

9.6 This comprises activity spaces which are essential to the provision of pharmaceutical services but which in certain circumstances may be available in a convenient location elsewhere. The amount of ECA which will need to be provided as part of an individual project will therefore vary according to the extent of the provision available elsewhere. The ECA costed in this Note is listed in the schedule at the end of this chapter.

**Optional accommodation/services (OAS)**

9.7 This Note, where appropriate, draws attention to alternative ways of providing services or facilities, including the likely cost implications. This information will enable project teams to select the solution which is most suitable to their needs.

**Dimensions and areas**

9.8 In determining spatial requirements, the essential factor is not the total area provided but the critical dimensions, ie those dimensions critical to the efficient functioning of the activities which are to be carried out. There are therefore no recommended areas associated with the schedule of activity spaces. To assist project teams in preparing detailed design solutions for the rooms and spaces, the Department has carried out studies to establish dimensional requirements in the form of critical dimensions. The results of these studies appear as ergonomic diagrams in the Appendix of this Note and in the Health Building Note No 40 "Common Activity Spaces".

9.9 It is recognised that for development planning and at the earliest stage of a design it may be convenient for designers to have data available which enables them to make an approximate assessment of the sizes involved. For this reason the schedules of areas, prepared for the purpose of establishing the cost allowance, are included at the end of this chapter. It is emphasised that the areas published DO NOT represent recommended room sizes nor specific individual entitlements.

9.10 Project teams should note that the spaces for activities which are common to two or more functional units should where possible be aggregated for economy. Areas of such spaces given in the schedules do not imply individual rooms and the cost allowances assume their combination into viable activity spaces.

**Circulation**

9.11 The schedule of areas used for costing will have an area for circulation within each functional unit, shown as an addition. It should be noted that for convenience the areas allowed for planning provision, engineering zone and for partitions are included in the area allowed for circulation.

**Primary Services**

9.12 For in-patient dispensing a DCA has been provided for two sizes of service, the smaller serving 450 to 600 beds and the larger 600 to 1,200 beds. Each contains the necessary provision for supply and dispensing for a ward service together with stores, offices and staff accommodation. Computer facilities and a seminar room have separate allowances under ECA as these may be available elsewhere. Flammables stores and a medical gas cylinders store also carry separate allowances as these will be built in an isolated location for safety and may be shared with other users.

9.13 The size of the sterile suite is dependent upon quantity dispensed and medical specialities served; a DCA has been provided for two sizes separate from in-patient services to give flexibility of choice. A cytotoxic preparation room has been separately provided as ECA.

9.14 Local conditions will determine the type of out-patient services unit required and a DCA is provided for both an attached unit and a remote unit.

9.15 Drug information may be provided at two levels; the DCA for the hosptial level is for a technical information room only whereas the allowance for a district centre includes for work and study areas a pharmacist's office, and store. Computer facilities, a seminar room and reprographic facilities will also be required but as these may be conveniently available elsewhere they have been separately provided as ECA.

**Pharmaceutical Support Services**

9.16 A sterile manufacturing suite is provided, comprising two aseptic rooms complete with preparation and cleaning areas, a filling area, sterilizing area, container preparation area, cleaning and staff changing. A pharmacist's office and an inspection/labelling room is also included. It is expected that this suite may serve up to 6,000 beds.

9.17 The DCA provides for a non-sterile manufacturing unit providing spaces for liquid products, dry products, ointments and creams, hazardous dry products and disinfectants, together with necessary labelling, cleaning, storage, container, and staff accommodation.

9.18 A single assembly unit has been included with provision for preparation, finishing, stores and staff accommodation. A tablet packing line is included in ECA.

9.19 ECA within the support services comprises goods reception/loading bay and a refuse collection store where no purchase and distribution unit is conveniently available. A flammables store and hazardous liquid packing area will be built in an isolated location for safety and may be shared with other users. The in-process control laboratory will only be necessary when there is no convenient quality control laboratory available.

**Quality Control Laboratory**

9.20 Quality control will be required with any manufacturing unit. The DCA allows for the necessary laboratories, stores, offices and staff areas. For laboratory workshops and microbiological testing suite an OAS allowance has been made to give the project team the choice of their provision.

**Purchase and Distribution**

9.21 The DCA provides for the necessary goods reception, unpacking and assembly areas, stores, offices and staff accommodation.

**Radiopharmaceuticals Preparation Unit**

9.22 Allowance has been made for two types of unit - closed and open procedures - each comprises work rooms with washing, changing and cleaning facilities supported by a preparation support room together with offices and staff accommodation where applicable.

**Engineering**

9.23 The DCA provides space for a heating and ventilation zone adjacent to the external walls and for small vertical ducts.

**Communications - plant space**

9.24 Plant rooms, with the exception of an electrical switch room and a standard enclosure for medical gas isolation points, are not included in the DCA.

**Engineering services**

9.25 The following engineering services as described in the Engineering Chapter and exemplified in Activity Data are included in the DCA. Primary engineering services are assumed to be conveniently available at the boundary of the department, but ventilation/air treatment plant is included in the allowance and is deemed to be located adjacent to the boundary of the department.

***Mechanical Services***

Drinking water, cold water services and hose reel piping to take off points (storage tanks and hose reels excluded).

Aspect zoned LTHW radiator heating system.

Domestic hot water system.

Treated water system.

Clean and dirty extract ventilation.

Piped gases as required.

Zone automatic controls for heating system and remote sensor thermostatic control valves where appropriate.

Thermal insulation for services to latest DHSS requirements.

Air treatment to Class 1, 2 and 3 as appropriate.

***Electrical Services***

Department distribution switchgear.

General lighting.

Fluorescent, tungsten and emergency lighting fittings as appropriate.

Socket outlets and other power outlets for fixed and portable equipment.

Standby and emergency installation from main hospital supplies.

Telephone conduits.

Impulse clocks and wiring.

Fire and security alarms.

Intercommunication systems.

***Equipment (Group 1)***

Powered pharmaceutical equipment as on ADB Sheets but shared between departments as QS schedules.

## Schedules of Areas

In-patient services - 450-600 beds

| *Activity Space* | *Quantity No* | *Space Area m²* | *Total m²* |
|---|---|---|---|
| Dispensary | 1 | 70.00 | 70.00 |
| Ward service area | 1 | 33.50 | 33.50 |
| Returnable box holding store | 1 | 12.50 | 12.50 |
| Containers wash-up | 1 | 8.00 | 8.00 |
| Goods reception/unpacking area | 1 | 25.00 | 25.00 |
| Main store | 1 | 76.50 | 76.50 |
| Cool store | 1 | 7.50 | 7.50 |
| Security store | 1 | 10.50 | 10.50 |
| Containers store | 1 | 9.50 | 9.50 |
| Returnable empties store | 1 | 10.00 | 10.00 |
| Emergency drug store | 1 | 5.50 | 5.50 |
| Principal Pharmacist's office | 1 | 10.00 | 10.00 |
| Staff Pharmacists' office | 1 | 11.00 | 11.00 |
| Clerk/Secretarial office | 1 | 12.00 | 12.00 |
| Storekeeper's office | 1 | 6.50 | 6.50 |
| Porter's base | 1 | 5.00 | 5.00 |
| Cleaning space | 1 | 7.00 | 7.00 |
| Staff room (8 persons) | 1 | 13.00 | 13.00 |
| Staff changing (2×8 places) | 2 | 6.50 | 13.00 |
| Staff WC | 2 | 2.00 | 4.00 |
| Switchroom | 1 | 3.00 | 3.00 |
| | Nett Total | | 353.00 |
| | Circulation etc | | 110.00 |
| | Total | | 463.00 |
| | Departmental Total | | 465 m² |

In-patient services - 600-1,200 beds

| *Activity Space* | *Quantity No* | *Space Area m²* | Total m² |
|---|---|---|---|
| Dispensary | 1 | 95.00 | 95.00 |
| Ward service area | 1 | 33.50 | 33.50 |
| Returnable box holding store | 1 | 14.00 | 14.00 |
| Containers wash-up | 1 | 8.00 | 8.00 |
| Goods reception/unpacking area | 1 | 25.00 | 25.00 |
| Main store | 1 | 104.00 | 104.00 |
| Cool store | 1 | 11.00 | 11.00 |
| Security store | 1 | 10.50 | 10.50 |
| Containers store | 1 | 13.00 | 13.00 |
| Returnable empties store | 1 | 10.00 | 10.00 |
| Emergency drug store | 1 | 5.50 | 5.50 |
| Principal Pharmacist's office | 1 | 10.00 | 10.00 |
| Staff Pharmacists' office | 1 | 14.00 | 14.00 |
| Clerk/Secretarial office | 1 | 19.00 | 19.00 |
| Storekeeper's office | 1 | 6.50 | 6.50 |
| Porter's base | 1 | 5.00 | 5.00 |
| Cleaning space | 1 | 7.00 | 7.00 |
| Staff room (12 persons) | 1 | 19.00 | 19.00 |
| Male staff changing (12 places) | 1 | 9.50 | 9.50 |
| Female staff changing (16 places) | 1 | 12.00 | 12.00 |
| Staff WC | 3 | 2.00 | 6.00 |
| Switchroom | 1 | 3.00 | 3.00 |
| | Nett Total | | 440.50 |
| | Circulation etc | | 138.00 |
| | Total | | 578.50 |
| | Departmental Total | | 580 m² |

Sterile Dispensing Suite—small size

| *Activity Space* | *Quantity No* | *Space Area m²* | *Total m²* |
|---|---|---|---|
| Wash/change/robe | 1 | 6.50 | 6.50 |
| Aseptic room | 1 | 7.50 | 7.50 |
| Support room | 1 | 11.00 | 11.00 |
| | Nett Total | | 25.00 |
| | Circulation etc | | 8.50 |
| | Total | | 33.50 |
| | Departmental Total | | 35 m² |

Sterile Dispensing Suite—large size

| *Activity Space* | *Quantity No* | *Space Area m²* | *Total m²* |
|---|---|---|---|
| Service lobby | 1 | 2.50 | 2.50 |
| Wash/change/robe | 1 | 6.50 | 6.50 |
| Aseptic wash/change | 1 | 5.00 | 5.00 |
| Aseptic room | 1 | 7.50 | 7.50 |
| Sterile store/weighing | 1 | 4.00 | 4.00 |
| Preparation area | 1 | 9.50 | 9.50 |
| Filling area | 1 | 5.50 | 5.50 |
| Finishing area | 1 | 11.00 | 11.00 |
| Sterilizer room | 1 | 4.00 | 4.00 |
| | Nett Total | | 55.50 |
| | Circulation etc | | 18.00 |
| | Total | | 73.50 |
| | Departmental Total | | 75 m² |

Out-patient services—attached location

| *Activity Space* | *Quantity No* | *Space Area m²* | *Total m²* |
|---|---|---|---|
| Waiting area | 1 | 16.00 | 16.00 |
| Interview cubicle | 1 | 7.00 | 7.00 |
| Out-patient service counter | 1 | 12.00 | 12.00 |
| | Nett Total | | 35.00 |
| | Circulation etc | | 7.50 |
| | Total | | 42.50 |
| | Departmental Total | | 45 m² |

Out-patient services—remote unit

| *Activity Space* | *Quantity No* | *Space Area m²* | *Total m²* |
|---|---|---|---|
| Waiting area | 1 | 16.00 | 16.00 |
| Interview cubicle | 1 | 7.00 | 7.00 |
| Out-patient service counter | 1 | 12.00 | 12.00 |
| Out-patient dispensary | 1 | 17.00 | 17.00 |
| | Nett Total | | 52.00 |
| | Circulation etc | | 10.50 |
| | Total | | 62.50 |
| | Departmental Total | | 65 m² |

Drug Information Unit—hospital level

| *Activity Space* | *Quantity No* | *Space Area m²* | *Total m²* |
|---|---|---|---|
| Technical information room | 1 | 18.00 | 18.00 |
| | Nett Total | | 18.00 |
| | Circulation etc | | 4.00 |
| | Total | | 22.00 |
| | Departmental Total | | 20 m² |

Drug Information Unit—district centre

| *Activity Space* | *Quantity No* | *Space Area m²* | *Total m²* |
|---|---|---|---|
| Main information work area | 1 | 60.50 | 60.50 |
| Quiet study area | 1 | 5.50 | 5.50 |
| Literature store | 1 | 7.00 | 7.00 |
| Pharmacist's office | 1 | 10.00 | 10.00 |
| | Nett Total | | 83.00 |
| | Circulation etc | | 17.00 |
| | Total | | 100.00 |
| | Departmental Total | | 100 m² |

**Schedules of Areas** (cont)

Support Services—sterile manufacture

| *Activity Space* | *Quantity No* | *Space Area m²* | *Total m²* |
|---|---|---|---|
| Still room | 1 | 6.50 | 6.50 |
| Ingredient weighing | 1 | 7.00 | 7.00 |
| Container unpacking | 1 | 10.00 | 10.00 |
| Container preparation | 1 | 21.00 | 21.00 |
| Wash/change/robe | 2 | 8.50 | 17.00 |
| Preparation area | 1 | 26.00 | 26.00 |
| Aseptic pre-preparation area | 1 | 5.50 | 5.50 |
| Equipment cleaning | 1 | 7.00 | 7.00 |
| Clean equipment store | 1 | 9.00 | 9.00 |
| Filling room | 1 | 17.50 | 17.50 |
| Transfer hatch | 1 | 8.00 | 8.00 |
| Aseptic wash/robe | 1 | 5.00 | 5.00 |
| Aseptic equipment store | 1 | 5.00 | 5.00 |
| Aseptic rooms | 2 | 7.25 | 14.50 |
| Sterilization loading/cooling | 1 | 35.50 | 35.50 |
| Sterilizer maintenance area | 1 | 22.50 | 22.50 |
| Inspection and labelling | 1 | 56.00 | 56.00 |
| Label preparation store | 1 | 13.50 | 13.50 |
| Containers store | 1 | 30.50 | 30.50 |
| Materials store | 1 | 22.50 | 22.50 |
| Quarantine store | 1 | 88.00 | 88.00 |
| Finished products store | 1 | 88.00 | 88.00 |
| Pharmacist's office | 1 | 10.00 | 10.00 |
| Staff room (12 persons) | 1 | 19.00 | 19.00 |
| Cleaning space | 0.5 | 7.00 | 3.50 |
| Staff changing (12 places) | 1 | 8.00 | 8.00 |
| Staff WC | 1 | 2.00 | 2.00 |
| Switchroom | 0.5 | 4.00 | 2.00 |
| | Nett Total | | 560.00 |
| | Circulation etc | | 175.00 |
| | Total | | 735.00 |
| | Departmental Total | | 735 m² |

Support Services—non-sterile manufacture

| *Activity Space* | *Quantity No* | *Space Area m²* | *Total m²* |
|---|---|---|---|
| Container preparation | 1 | 37.00 | 37.00 |
| Ingredient weighing | 1 | 11.00 | 11.00 |
| Dry products area | 1 | 16.00 | 16.00 |
| Liquid products area | 1 | 27.50 | 27.50 |
| Ointments and creams area | 1 | 30.00 | 30.00 |
| Disinfectants area | 1 | 8.50 | 8.50 |
| Hazardous dry products area | 1 | 8.00 | 8.00 |
| Finishing area | 1 | 16.00 | 16.00 |
| Equipment cleaning | 1 | 14.50 | 14.50 |
| Clean equipment store | 1 | 11.00 | 11.00 |
| Materials store | 1 | 27.00 | 27.00 |
| Quarantine store | 1 | 21.00 | 21.00 |
| Finished products store | 1 | 28.00 | 28.00 |
| Returnable empties store | 1 | 23.00 | 23.00 |
| Containers store | 1 | 19.00 | 19.00 |
| Pharmacist's office | 1 | 10.00 | 10.00 |
| Staff room (8 persons) | 1 | 11.00 | 11.00 |
| Cleaning space | 0.5 | 7.00 | 3.50 |
| Staff changing (8 places) | 1 | 6.00 | 6.00 |
| Staff WC | 1 | 2.00 | 2.00 |
| Switchroom | 0.5 | 4.00 | 2.00 |
| | Nett Total | | 332.00 |
| | Circulation etc | | 103.50 |
| | Total | | 435.50 |
| | Departmental Total | | 435 m² |

Support Services—Assembly

| *Activity Space* | *Quantity No* | *Space Area m²* | *Total m²* |
|---|---|---|---|
| Container preparation | 1 | 15.00 | 15.00 |
| Pack/repack area | 1 | 43.00 | 43.00 |
| Tablet packing area | 1 | 9.50 | 9.50 |
| Equipment cleaning | 1 | 8.50 | 8.50 |
| Finishing area | 1 | 16.00 | 16.00 |
| Materials store | 1 | 7.50 | 7.50 |
| Containers store | 1 | 15.00 | 15.00 |
| Clean equipment store | 1 | 6.50 | 6.50 |
| Packed products store | 1 | 11.50 | 11.50 |
| Pharmacist's office | 1 | 10.00 | 10.00 |
| Staff room (6 persons) | 1 | 9.50 | 9.50 |
| Cleaning space | 0.5 | 7.00 | 3.50 |
| Staff changing (6 places) | 1 | 4.50 | 4.50 |
| Staff WC | 2 | 2.00 | 4.00 |
| Switchroom | 0.5 | 4.00 | 2.00 |
| | Nett Total | | 166.00 |
| | Circulation etc | | 52.00 |
| | Total | | 218.00 |
| | Departmental Total | | 218 m² |

Support Services—Quality Control

| *Activity Space* | *Quantity No* | *Space Area m²* | *Total m²* |
|---|---|---|---|
| Weighing facility | 1 | 5.00 | 5.00 |
| Chemical testing laboratory | 1 | 51.00 | 51.00 |
| Instrument laboratory | 1 | 43.00 | 43.00 |
| Reference sample store | 1 | 15.00 | 15.00 |
| Office/sample reception | 1 | 23.00 | 23.00 |
| Computer facilities | 1 | 7.50 | 7.50 |
| Cleaning space | 0.5 | 7.00 | 3.50 |
| Staff room (6 persons) | 1 | 9.50 | 9.50 |
| Staff changing (6 places) | 1 | 4.50 | 4.50 |
| Staff WC | 1 | 2.00 | 2.00 |
| Switchroom | 0.5 | 4.00 | 2.00 |
| | Nett Total | | 166.50 |
| | Circulation etc | | 53.50 |
| | Total | | 219.00 |
| | Departmental Total | | 220 m² |

Purchase and distribution

| *Activity Space* | *Quantity No* | *Space Area m²* | *Total m²* |
|---|---|---|---|
| Goods reception/loading bay | 1 | 36.00 | 36.00 |
| Unpacking area | 1 | 18.00 | 18.00 |
| Despatch assembly area | 1 | 36.50 | 36.50 |
| Returnable empties store | 1 | 20.00 | 20.00 |
| New containers store | 1 | 21.50 | 21.50 |
| Bulk fluids store | 1 | 76.00 | 76.00 |
| Main store | 1 | 120.50 | 120.50 |
| Cool store | 1 | 21.50 | 21.50 |
| Security store | 1 | 20.50 | 20.50 |
| Refuse collection area | 1 | 25.00 | 25.00 |
| Pharmacist's office | 1 | 10.00 | 10.00 |
| Stock control/record storage | 1 | 24.00 | 24.00 |
| Storekeeper's office | 1 | 6.50 | 6.50 |
| Computer facilities | 1 | 7.50 | 7.50 |
| Cleaning space | 0.5 | 7.00 | 3.50 |
| Staff changing (6 places) | 1 | 4.50 | 4.50 |
| Staff WC | 2 | 2.00 | 4.00 |
| Switchroom | 0.5 | 4.00 | 2.00 |
| | Nett Total | | 457.50 |
| | Circulation etc | | 95.00 |
| | Total | | 552.50 |
| | Departmental Total | | 555 m² |

**Schedules of Areas** (cont)

Radiopharmaceuticals Preparation Unit—Closed procedures

| *Activity Space* | *Quantity No* | *Space Area $m^2$* | *Total $m^2$* |
|---|---|---|---|
| Staff change/robe | 1 | 8.50 | 8.50 |
| Support room | 1 | 14.00 | 14.00 |
| Closed procedures room | 1 | 7.00 | 7.00 |
| | Nett Total | | 29.50 |
| | Circulation etc | | 5.50 |
| | Total | | 35.00 |
| | Departmental Total | | 35 $m^2$ |

Radiopharmaceuticals Preparation Unit—Open procedures

| *Activity Space* | *Quantity No* | *Space Area $m^2$* | *Total $m^2$* |
|---|---|---|---|
| Staff change/robe | 1 | 9.50 | 9.50 |
| Cleaning bay | 1 | 1.50 | 1.50 |
| Preparation/support room | 1 | 27.00 | 27.00 |
| Aseptic wash/robe | 1 | 5.50 | 5.50 |
| Aseptic room | 1 | 7.00 | 7.00 |
| Pharmacist's office | 1 | 9.50 | 9.50 |
| Staff room (3 persons) | 1 | 5.00 | 5.00 |
| Staff WC | 1 | 2.00 | 2.00 |
| Switchroom | 0.5 | 4.00 | 2.00 |
| | Nett Total | | 69.00 |
| | Circulation etc | | 13.00 |
| | Total | | 82.00 |
| | Departmental Total | | 80 $m^2$ |

Essential Complementary Accommodation (ECA)

| *Activity Space* | *Quantity No* | *Space Area $m^2$* | *Circulation etc $m^2$* | *Total $m^2$* |
|---|---|---|---|---|
| Seminar room (8 persons) | 1 | 16.00 | 5.00 | 21.00 |
| Seminar room (20 persons) | 1 | 30.00 | 9.00 | 39.00 |
| Flammables store | 1 | 9.50 | 3.00 | 12.50 |
| Medical gas cylinders store | 1 | 27.50 | 8.50 | 36.00 |
| Computer facilities | 1 | 7.50 | 2.50 | 10.00 |
| In-process control laboratory | 1 | 15.50 | 4.50 | 20.00 |
| Still room | 1 | 3.50 | 1.00 | 4.50 |
| Porter's base | 1 | 6.00 | 2.00 | 8.00 |
| Goods reception/loading bay | 1 | 14.00 | 4.00 | 18.00 |
| Flammable/Hazardous liquid filling area | 1 | 14.00 | 4.00 | 18.00 |
| Refuse collection store | 1 | 31.50 | 9.50 | 41.00 |
| Laboratory workshop | 1 | 13.00 | 4.00 | 17.00 |
| Microbiological testing suite | 1 | 28.50 | 8.50 | 37.00 |
| Cytotoxic preparation room | 1 | 8.00 | 2.50 | 10.50 |

Optional Accommodation/Services (OAS)

| *Activity Space* | *Quantity No* | *Space Area $m^2$* | *Circulation etc $m^2$* | *Total $m^2$* |
|---|---|---|---|---|
| General office/reprographic services | 1 | 18.50 | 5.50 | 24.00 |
| Tablet packing line | 1 | 35.50 | 10.50 | 46.00 |
| Engineer's office/manufacturing services | 1 | 9.50 | 3.00 | 12.50 |

# 10 Activity Data

10.1 The expression 'Activity Data' refers to an information system developed to help project and design teams by defining the users' needs more precisely. This information constitutes the Activity Data Base, issued to Regional Health Authorities in England and to the Health Departments in Scotland, Northern Ireland and Wales in 1976. It comprises two types of information sheet: Activity Space Data Sheets (known as 'A' sheets) and their supporting Activity Unit Data Sheets (known as 'B' sheets).

10.2 'A' sheets record in more detail than elsewhere in this Note each task or activity that is performed in a particular activity space (which may be a room, space or bay) together with details of the environmental conditions and technical data necessary to enable the activities to be performed. Each 'A' sheet also contains a list of the titles and code numbers of the relevant 'B' sheets.

10.3 'B' sheets provide narrative text and graphics to scale relating to one activity. They show equipment fitted or supplied as part of the building, and the necessary engineering terminals. There are also "component B sheets" which show a range of particular components rather than an activity.

10.4 Further information about the use and preparation of Activity Data can be found in the "Guide to 'A' and 'B' Activity Data Sheets and their use in Health Building Schemes", which was issued to Regional Health Authorities in June 1980, and to NHS Authorities in Wales in November 1980. Copies of the Guide are available from the Department's Directorate of Health Building, Branch HBD 3, Euston Tower, 286 Euston Road, London NW1 3DN.

### Activity Data applicable to this Note

10.5 The 'A' and 'B' sheets recommended for the activity spaces described in this Note are either new sheets, amended ones, or selected from existing sheets. Their code numbers and titles are provided on the lists which follow.

10.6 Further Activity Data sheets may be selected, or drawn up by project teams to their own requirements, for any services not described in the Note or included in the list. Members of project teams are advised to contact their Regional Activity Data Co-ordinator/Welsh Office for information and advice about the selection of activity data, at an early planning stage. However, in order to ensure consistent and economic provision, variations from the 'A' sheets recommended for the spaces covered in this Note should be considered only where it has been decided that the function of a space will differ substantially from that described.

LIST OF ACTIVITY DATA 'A' SHEETS

Primary Services

| *Activity space* | *'A' sheet code no* | *para number in building note* |
|---|---|---|
| **In-patient dispensing (450-600 beds)** | | |
| Dispensary | Z0104 | 4.9 |
| Ward service area | W0206 | 4.39 |
| Returnable box holding store | W0210 | 4.19 |
| Container wash-up | Z0107 | 4.38 |
| Goods reception/unpacking area | W0202 | 4.51 |
| Main store | W0201 | 4.57 |
| Cool store | W0204 | 4.58 |
| Security store | W0203 | 4.61 |
| Container store | W0208 | 4.62 |
| Returnable empties store | W0211 | 4.54 |
| Emergency drug store | W0205 | 4.66 |
| Principal Pharmacist's office | M0521 | 4.68 |
| Staff Pharmacists' office | M0515 | 4.69 |
| Clerk/secretarial office | M1307 | 4.68 |
| Storekeeper's office | M1603 | 4.53 |
| Porter's base | M1707 | 4.70 |
| Cleaning space | Y1504 | 4.71 |
| Staff room (8 persons) | D0111 | 4.73 |
| Staff changing (2×8 places) | V0417 | 4.72 |
| Staff WC | V1005 | 4.72 |
| Switchroom | K0101 | - |
| **In-patient dispensing (600-1200)** | | |
| Dispensary | Z0105 | 4.9 |
| Ward service area | W0206 | 4.39 |
| Returnable box holding store* | W0210 | 4.19 |
| Container wash-up | Z0107 | 4.38 |
| Goods reception/unpacking | W0202 | 4.51 |
| Main store | W0207 | 4.57 |
| Cool store* | W0204 | 4.58 |
| Security store | W0203 | 4.61 |
| Container store* | W0208 | 4.62 |
| Returnable empties store | W0211 | 4.54 |
| Emergency drug store | W0205 | 4.66 |
| Principal Pharmacist's office | M0521 | 4.68 |
| Staff Pharmacists' office* | M0515 | 4.69 |
| Clerk/secretarial office* | M1307 | 4.68 |
| Storekeeper's office | M1603 | 4.53 |
| Porter's base | M1707 | 4.70 |
| Cleaning space* | Y1504 | 4.71 |
| Staff room (12 persons) | D0112 | 4.73 |
| Staff changing (2×8 places) | V0417 | 4.72 |
| Staff WC | V1005 | 4.72 |
| Switchroom | K0101 | - |
| with areas marked * enlarged | | 4.75 |

Primary Services

| *Activity space* | *'A' sheet code no* | *para number in building note* |
|---|---|---|
| **Sterile dispensing suite (small size)** | | |
| Wash/change/robe | Z0302 | 4.27 |
| Aseptic room | Z0303 | 4.28 |
| Support room | Z0201 | 4.29 |
| Sterile dispensing suite (large size) | | |
| Service lobby | Z0202 | 4.32 |
| Wash/change/robe | Z0302 | 4.33 |
| Aseptic wash/change | Z0301 | 4.33 |
| Aseptic room | Z0303 | 4.33 |
| Sterile store/weighing | Z0203 | 4.34 |
| Preparation area | Z0204 | 4.34 |
| Filling area | Z0207 | 4.35 |
| Finishing area | Z0207 | 4.35 |
| Sterilizer room | Z0206 | 4.35 |
| **Out-patient dispensing – attached location** | | |
| Waiting area | Z0101 | 4.21 |
| Interview cubicle | M0709 | 4.22 |
| Out-patient service counter | Z0102 | 4.20 |
| **Out-patient dispensing – remote unit** | | |
| Waiting area | Z0101 | 4.23 |
| Interview cubicle | M0709 | |
| Out-patient service counter | Z0102 | |
| Out-patient dispensary | Z0103 | |
| **Drug information unit – hospital level** | | |
| Technical information room | Z0702 | 4.80 |
| **Drug information unit – district centre** | | |
| Main information work area | Z0703 | 4.84 |
| Quiet study area | H1002 | 4.85 |
| Literature store | W0238 | 4.84 |
| Pharmacist's office | M0522 | 4.86 |

Support Services

| *Activity space* | *'A' sheet code no* | *para number in building note* |
|---|---|---|
| **Sterile manufacture** | | |
| Still room | Z0506 | 5.35 |
| Ingredient weighing | Z0402 | 5.20 |
| Container unpacking | Z0403A | 5.21 |
| Container preparation | Z0403 | 5.21 |
| Wash/change/robe | Z0302 | 5.19/5.28 |
| Preparation area | Z0404 | 5.23 |
| Aseptic pre-preparation area | Z0401 | 5.26 |
| Equipment cleaning | Z0407 | 5.29 |
| Clean equipment store | W0232 | 5.29 |
| Filling area | Z0405 | 5.24 |
| Transfer hatch | Z0406 | 5.27 |
| Aseptic wash/robe | Z0301 | 5.28 |
| Aseptic equipment store | Z0304 | 5.26 |
| Aseptic rooms | Z0303 | 5.26 |
| Sterilization loading/cooling | Z0408 | 5.36/5.39 |
| Sterilizer maintenance area | Z0409 | 5.38 |
| Inspection and labelling | Z0410 | 5.40 |
| Label preparation store | Z0511 | 5.10 |
| Containers store | W0233 | 5.9 |
| Materials store | W0228 | 5.9 |
| Quarantine store | W0234 | 5.8/5.11/ 5.40 |
| Finished products store | W0235 | 5.11 |
| Pharmacist's office | M0520 | 5.15 |
| Staff room (12 persons) | D0112 | Figure 8 |
| Cleaning space | Y1504 | 5.30 |
| Staff changing (12 places) | V0427 | Figure 8 |
| Staff WC | V1005 | - |
| Switchroom | K0101 | - |

LIST OF ACTIVITY DATA 'A' SHEETS

Support Services

| *Activity space* | *'A' sheet code no* | *para number in building note* |
|---|---|---|
| **Non-sterile manufacture** | | |
| Container preparation | Z0508 | 5.41 |
| Ingredient weighing | Z0501 | 5.41 |
| Dry products area | Z0502 | 5.45 |
| Liquid products area | Z0504 | 5.44 |
| Ointments and creams area | Z0503 | 5.48 |
| Disinfectants area | Z0507 | 5.45 |
| Hazardous dry products area | Z0509 | 5.45 |
| Finishing area | Z0516 | 5.49 |
| Equipment cleaning | Z0510 | 5.47 |
| Clean equipment store | W0226 | 5.47 |
| Materials store | W0229 | 5.9 |
| Quarantine store | W0223 | 5.8/5.11/ 5.50 |
| Finished products store | W0230 | 5.50 |
| Returnable empties store | W0224 | 5.9 |
| Containers store | W0222 | 5.42 |
| Pharmacist's office | M0520 | 5.15 |
| Staff room (8 persons) | D0111 | Figure 8 |
| Cleaning space | Y1504 | - |
| Staff changing (8 places) | V0426 | 5.43 |
| Staff WC | V1005 | - |
| Switchroom | K0101 | - |
| **Assembly** | | |
| Container preparation | Z0518 | 5.51 |
| Pack/repack area | Z0514 | 5.51/5.53 |
| Tablet packing area | Z0512 | 5.52 |
| Equipment cleaning | Z0517 | 5.56 |
| Finishing area | Z0516 | 5.55 |
| Materials store | W0227 | 5.55 |
| Containers store | W0222 | 5.57 |
| Clean equipment store | W0213 | 5.55 |
| Packed products store | W0231 | 5.55 |
| Pharmacist's office | M0520 | 5.57 |
| Staff room (6 persons) | D0110 | - |
| Cleaning space | Y1504 | 5.30 |
| Staff changing (6 places) | V0425 | 5.30 |
| Staff WC | V1005 | - |
| Switchroom | K0101 | - |
| **Quality Control** | | |
| Weighing facility | Z0607 | 5.68 |
| Chemical testing laboratory | Z0601 | 5.63 |
| Instrument laboratory | Z0602 | 5.65 |
| Reference sample store | W0212 | 5.74 |
| Office/sample reception | Z0606 | 5.60/5.51 |
| Computer facilities | M0401 | 5.76 |
| Cleaning space | Y1504 | - |
| Staff room (6 persons) | D0110 | - |
| Staff changing (6 places) | V0425 | - |
| Staff WC | V1005 | - |
| Switchroom | K0101 | - |
| **Purchase and distribution** | | |
| Goods reception/loading bay | W0218 | 5.79 |
| Unpacking area | W0214 | 5.78 |
| Despatch assembly area | W0216 | 5.78 |
| Returnable empties store | W0221 | 4.54 |
| New containers store | W0222 | 4.62 |
| Bulk fluids store | W0215 | 5.80 |
| Main store | W0220 | 4.57 |
| Cool store | W0204 | 4.58 |
| Security store | W0217 | 5.81 |
| Refuse collection area | W0219 | 5.78 |
| Pharmacist's office | M0523 | 5.82 |
| Stock control/record storage | M1013 | 5.82 |
| Storekeeper's office | M1601 | 4.53 |
| Computer facilities | M0403 | 5.82 |
| Cleaning space | Y1504 | - |
| Staff changing (6 places) | V0425 | - |
| Staff WC | V1005 | - |
| Switchroom | K0101 | - |

LIST OF ACTIVITY DATA 'A' SHEETS

Radiopharmaceuticals Preparation Unit

| *Activity space* | *'A' sheet code no* | *para number in building note* |
|---|---|---|
| **Closed Procedure** | | |
| Staff change/robe | Z0805 | 6.12 |
| Support room | Z0804 | 6.12 |
| Closed procedures room | Z0802 | 6.11 |
| **Open Procedures** | | |
| Staff change/robe | Z0805 | 6.13 |
| Cleaning bay | - | - |
| Preparation/support room | Z0803 | 6.14 |
| Aseptic wash/robe | Z0806 | 6.15 |
| Aseptic room | Z0801 | 6.14 |
| Pharmacist's office | M0514 | 6.16 |
| Staff room (3 persons) | - | - |
| Staff WC | V1005 | - |
| Switchroom | K0101 | - |

LIST OF ACTIVITY DATA 'A' SHEETS

Support Services

| *Activity space* | *'A' sheet code no* | *para number in building note* |
|---|---|---|
| **Essential Complementary Accommodation (ECA)** | | |
| Seminar room (8 persons) | H0509 | 4.74 |
| Seminar room (20 persons) | H0508 | 4.87 |
| Flammables store | W0209 | 4.64 |
| Medical gas cylinders store | W0239 | 4.65 |
| Computer facilities | M0403 | 4.89 |
| In-process control laboratory | Z0106 | 4.37 |
| Still room | Z0505 | 5.35 |
| Porter's base | M1707 | 5.82 |
| Goods reception/loading bay | W0218 | 4.51 |
| Flammable/Hazardous liquid filling area | Z0515 | 5.46 |
| Refuse collection store | W0219 | 3.8 |
| Laboratory workshop | Z0605 | 5.69 |
| Microbiological testing suite | Z0603/4 | 5.70 |
| Cytotoxic preparation room | Z0305 | 4.18 |
| **Optional Accommodation/Services (OAS)** | | |
| General office/reprographic services | M1016 | 4.86 |
| Tablet packing line | Z0512 | 5.52 |
| Engineer's office/manufacturing services | M0525 | - |

| "B" Sheet Code No | Activity Unit Title |
|---|---|
| A02AH | CLEANSING Clinical handwashing |
| A24AN | TREATMENT First aid cabinet |
| A24BZ | TREATMENT Emergency eye irrigation |
| A38AA | ANAESTHESIA Gas cylinder storage carrels |
| A38AB | ANAESTHESIA Gas cylinder storage rack, cyclopropane |
| A38AR | ANAESTHESIA Gas cylinder storage rack, horizontal, capacity 12 |
| A38AS | ANAESTHESIA Gas cylinder storage rack, inclined, capacity 12 |
| A55AA | PHARMACY Cleansing, wash up unit |
| A55AD | PHARMACY Checking bench |
| A55AF | PHARMACY Radiopharmaceutical dispensing, contained workstation |
| A55AG | PHARMACY Radiopharmaceutical Isotope Assay Calibrator |
| A55AJ | PHARMACY Preparation, pharmaceuticals, aseptic |
| A55AK | PHARMACY Preparation, storage, prescripions, worktop, sink unit, shelves over |
| A55AM | PHARMACY Preparation, quality control |
| A55AO | PHARMACY Reception counter, pharmacy supplies |
| A55AR | PHARMACY Preparation/storage/labelling worktop with drawer, units under |
| A55AS | PHARMACY Radiopharmaceuticals; materials storage |
| A55AT | PHARMACY Pharmaceutical dose forms, worktop, cupboards, shelves over |
| A55AU | PHARMACY PREPARATION Pharmaceutical dose forms worktop drawers, 3 shelves over |
| A55AV | PHARMACY Storage, drug cupboard, night supply, lockable |
| A55AX | PHARMACY Storage, controlled drugs cabinet |
| A55AY | PHARMACY Storage, controlled drugs cabinet, working supply |
| A55AZ | PHARMACY Preparation/storage with deionised water supply |
| A55BC | PHARMACY Counter service, out-patients |
| A55BD | PHARMACY Mechanised storage, selection unit |
| A55BE | PHARMACY Seating bench transition barrier to clean areas |
| A55BF | PHARMACY Tablet prepacking line |
| A55BG | PHARMACY Nitrogen manifold |
| A55BH | PHARMACY Filling bench, vertical laminar flow |
| A55BJ | PHARMACY Sterility testing station |
| A55BK | PHARMACY Pouring bench, laminar flow, small |
| A55BL | PHARMACY Tablet counter, in work cubicle |
| A55BM | PHARMACY Tablet counter, in work cubicle, enclosed |
| A55BN | PHARMACY Lobby pass through with hinged shelf |
| A55BO | PHARMACY Clinical handwashing and drying unit, Pharmacy Sterile Suite |
| A55BP | PHARMACY Preparation worktop |
| A55BQ | PHARMACY Viewer, liquid inspection, bench mounted |
| B02AY | CLEANSING Sink unit |
| B02BI | CLEANSING Sink unit with cupboard under drainer |
| B02BK | CLEANSING Laboratory equipment, one bowl sink |
| B02CA | CLEANSING Hose 6 m & reel, wall mounted |
| B02CI | CLEANSING Worktop & sink unit |
| B02CL | CLEANSING Large double S/S sink & drainer |
| B02CW | CLEANSING Sink unit, Radioactive materials |
| B04BY | STORAGE Cupboard 1800 × 900 × 450 mm steel lockable |
| B04KE | STORAGE Burrette & glass measuring cylinder cupboard |
| B04LJ | STORAGE Cupboard key 200 hooks |
| B04NL | STORAGE Cupboard stationery 1800 × 900 × 450 mm shutter front lockable |
| B04RB | STORAGE Cupboard, flammable liquids, lockable |
| B04RC | STORAGE First Aid respirator |
| B04RD | STORAGE Cupboard pass-through, sterile supplies, interlocking doors |
| B04RE | STORAGE Pallet racking, double height, triple bay (12 pallets) |
| B04RF | STORAGE Pallet racking, double height, double bay (8 pallets) |
| B05CG | PREPARATION/STORAGE Cupboard and worktop 2400 × 600 mm |
| B05CL | PREPARATION/STORAGE Reception counter, intermittent use |
| B06BX | PREPARATION Beverages & snacks, visitors suite |
| B09AC | DISPOSAL Liquid waste |
| B09BM | DISPOSAL Can and bottle crusher |
| B09BP | DISPOSAL Refuse baling machine, manual |

LIST OF ACTIVITY UNIT DATA "B" SHEETS

| "B" Sheet Code No | Activity Unit Title |
|---|---|
| B11AF | RECEPTION Counter, administrative, collection of charges |
| B11BH | RECEPTION Counter dispatch hatch, vertical sliding panel |
| B11BL | RECEPTION Numbered ticket dispenser for patient recall by number control |
| B12AA | PROCESSING Mixer/emulsifier, floor standing, electric |
| B12BU | PROCESSING Drying cabinet, glassware |
| B12CF | PROCESSING Autoclave, bottled fluids |
| B12CK | PROCESSING Drying cabinet |
| B12CO | PROCESSING Fume cupboard, gas, water, socket outlet and drip cup |
| B12CQ | PROCESSING Fume cupboard, without laboratory services |
| B12CY | PROCESSING Print/labelling unit |
| B12CZ | PROCESSING Paste mill |
| B12DA | PROCESSING Steam jacketed pan |
| B12DB | PROCESSING Capsule filler, semi-automatic |
| B12DC | PROCESSING Tube filling machine |
| B12DD | PROCESSING Din cap sealer, foot operated |
| B12DE | PROCESSING Bottom filling machine for liquids |
| B12DF | PROCESSING Volumetric liquid filling machine |
| B12DG | PROCESSING Sterilizing oven, 70L capacity |
| B12DJ | PROCESSING Sterilizer, small volume, fluids, bench mounted |
| B12DH | PROCESSING Sterilizer, bottled fluids, 28 cu ft |
| B12DK | PROCESSING Pressure vessel, liquid filtration, 100 mm, filter holder |
| B12DL | PROCESSING Pressure filtration for sterile fluids, 300 mm filter holder |
| B12DM | PROCESSING Mixer/emulsifier, floor standing, electric |
| B12DN | PROCESSING Bottle washing machine, large, steam heated |
| B12DP | PROCESSING Bottle washer conveyor, clean side |
| B12DQ | PROCESSING Bottle washer conveyor, dirty side |
| B12DR | PROCESSING Walk-in fume cupboard, large |
| B12DS | PROCESSING Heat sealer bags |
| B12DT | PROCESSING Water still 115 L/Hr |
| B12DU | PROCESSING Water storage vessel, S/S 200 L |
| B12DV | PROCESSING Water storage vessel, S/S 1000 L with recycling main |
| B12DW | PROCESSING Distilled water, recycling main, draw off point |
| B12DX | PROCESSING Flammable gas cylinders - two cylinders (fitted externally) |
| B12DY | PROCESSING Pallet cover dispenser unit |
| B12DZ | PROCESSING Wrapping station |
| B12EA | PROCESSING Strap wrapping machine |
| B12EB | PROCESSING Large fume cupboard, fuel gas outlet, water and drip cup |
| B12EC | PROCESSING Hazardous products preparation with laminar flow free standing model |
| B12ED | PROCESSING Oven sterilizing, 188 L. capacity |
| B12EF | PROCESSING Still, water, 90 L/Hr |
| B12EG | PROCESSING Still, water, electric, 120 L/Hr |
| B12EH | PROCESSING Closure washing machine |
| B12EJ | PROCESSING Bottle washing machine, mobile, 6 bottles |
| B12EK | PROCESSING Label printer |
| B14AD | ADMINISTRATION Desk double pedestal with chair, telephone and socket outlet |
| B14AQ | ADMINISTRATION Desk single pedestal with chair, and socket outlet |
| B14AY | ADMINISTRATION Single pedestal desk with chair, telephone and socket outlet |
| B15AG | SECRETARIAL Typist desk unit |
| B15AI | SECRETARIAL Desk unit with telephone and socket outlet |
| B16AA | COMMUNICATION Telephone wall mounted, with writing shelf |
| B20AL | RECORDING Writing flap 600 × 400 mm |
| B21AR | OFFICE PROCEDURES Plate embosser |
| B21AS | OFFICE PROCEDURES Plate printer |
| B21BB | OFFICE PROCEDURES Photocopying machine and collator |
| B21BC | OFFICE PROCEDURES Duplicating machine, off set |
| B21BJ | OFFICE PROCEDURES Photocopying, dry copier, bench model |
| B23AC | INFORMATION TECHNOLOGY Computer tabulator file |
| B23AD | INFORMATION TECHNOLOGY Microfile reading station |
| B23AE | INFORMATION TECHNOLOGY Word processing and information retrieval |

| "B" Sheet Code No | Activity Unit Title |
|---|---|
| B23AF | INFORMATION TECHNOLOGY Mini-computer, hard disc, VDU and printer |
| B23AG | INFORMATION TECHNOLOGY Micro-computer, floppy disc unit and small printer |
| B23BR | INFORMATION TECHNOLOGY Visible index strip, 50 panel, with display panel, wall mounted |
| B24AG | EDUCATION Lectern, with light, microphone and chair |
| B24AQ | EDUCATION Glassboard, wall mounted, with light and projector screen |
| B24AX | EDUCATION Overhead projector and mobile stand |
| B24CC | EDUCATION Carrell, freestanding, with strip light and socket outlet |
| B27AV | TOILET WC staff, female |
| B27BA | TOILET Personal washing |
| B27BC | TOILET Handrinse basin, single |
| B27EB | CATERING Handrinse basin, single preparation area |
| B27FP | TOILET Shower, decontamination, staff |
| B31CR | PARKING Kickabout, 350 mm diameter |
| B31EA | PARKING Steps, 3 tread, mobile |
| B31GT | PARKING Fork lift, 2.8 lift |
| B32DE | LABORATORY INVESTIGATION Bench unit with extract hood |
| B32ER | LABORATORY INVESTIGATION Bench unit with extract hood |
| B32ER | LABORATORY INVESTIGATION Spectrophotometry bench unit |
| B32ES | LABORATORY INVESTIGATION Atomic absorbtiometer, bench unit, ht 900 mm |
| B32GJ | LABORATORY INVESTIGATION Incubator, free standing |
| B32GK | LABORATORY INVESTIGATION Flame photometer |
| B32GL | LABORATORY INVESTIGATION Workbench with scaffold, cupboards under, 4500 × 600 mm |
| B48AN | MAINTENANCE Engineering bench |
| B52AA | CLEANSING Sink unit |
| B52AC | CLEANSING (DOMESTIC SERVICES) Wash bay 1800 × 1000 base |
| B52AD | CLEANSING (DOMESTIC SERVICES) Wash bay 1000 × 1000 base |
| B52AE | CLEANSING/PHARMACY Sterile suite |
| B53DG | CATERING Preparation, mixer 30qt, floor mounted |
| B54AL | LABORATORY EQUIPMENT PH meter |
| B54AV | LABORATORY EQUIPMENT Air compressor, small |
| B54AW | LABORATORY EQUIPMENT Microscope, binocular |
| B54AX | LABORATORY EQUIPMENT Oven |
| B54AY | LABORATORY EQUIPMENT Sterilizer, steam |
| B54AZ | LABORATORY EQUIPMENT Polarimeter |
| B54BA | LABORATORY EQUIPMENT Spectrophotometer, UV, double beam |
| B54BB | LABORATORY EQUIPMENT Glassware washing machine |
| C01CB | CLOTHES STORAGE Locker, clothes, twin, 1800 × 600 × 530 mm |
| C01CF | CLOTHES STORAGE Locker, luggage, twin, 1800 × 450 × 500 mm |
| C01GA | CLOTHES STORAGE Locker, small, wall mounted 300 × 300 × 300 mm |
| C01GB | CLOTHES STORAGE Locker, small, wall mounted 300 × 600 × 300 mm |
| C01GE | CLOTHES STORAGE Lockers, handbag, luggage, etc, small, 4 tier 1800 × 300 × 450 mm |
| C01GF | CLOTHES STORAGE Lockers, handbag, luggage, etc, small, 5 tier 1500 × 300 × 300 mm |
| C03CA | STORAGE Hook, hat and coat, one |
| C03CB | STORAGE Hook, hat and coat, two |
| C03CC | STORAGE Hook, hat and coat, three |
| C03CD | STORAGE Hook, hat and coat, four |
| C03GI | STORAGE Clip, spring 32 mm diameter |
| C04CA | CHAIR Stacking |
| C04CB | CHAIRS Chair, upright, with arm, stacking |
| C04CC | CHAIRS Chair, upright, with writing arm, stacking |
| C04CD | CHAIRS Chair, upright, with arms |
| C04CE | CHAIRS Chair, upright, with arms, upholstered |
| C04CF | CHAIRS Chair, upright |
| C04CG | CHAIRS Chair, easy, with open arms, low back |
| C04CH | CHAIRS Chair, easy, with open arms, high back |
| C04CI | CHAIRS Chair, easy, unit |
| C04CJ | CHAIRS Chair, easy, unit, waterproof cover |
| C04CL | CHAIRS Chair, easy, fully upholstered, low back |
| C04EA | CHAIRS Chair, adjustable 450-550 mm |

LIST OF ACTIVITY UNIT DATA "B" SHEETS

| "B" Sheet Code No | Activity Unit Title |
|---|---|
| C04EB | CHAIRS Chair, adjustable 500-625 mm |
| C04HA | CHAIRS Chair, venepuncture |
| C04HB | CHAIRS Chair, anaesthetist, adjustable height, ss |
| C09CA | TABLES Table, 650 × 1200 × 600 mm |
| C09CB | TABLES Table, 710 × 600 × 450 mm |
| C09CC | TABLES Table, 710 × 840 × 530 mm |
| C09CD | TABLES Table, 710 × 900 × 600 mm |
| C09CE | TABLES Table, 710 × 900 × 900 mm |
| C09CF | TABLES Table, 710 × 1200 × 600 mm |
| C09CG | TABLES Table, 710 × 1200 × 900 mm |
| C09CH | TABLES Table, 710 × 1500 × 900 mm |
| C09CI | TABLES Table, 710 × 1800 × 900 mm |
| C09EM | TABLES Table, committee 710 × 1800 × 1200 mm |
| C09EN | TABLES Table, committee 710 × 2400 × 820 mm |
| C09EO | TABLES Table, committee 710 × 1230 × 820 mm |
| C09FA | TABLES Table, occasional, square, 400 × 600 × 600 mm |
| C09FB | TABLES Table, occasional, 450 × 600 × 450 mm with shelf |
| C09FC | TABLES Table, occasional, 530 × 840 × 455 mm with shelf |
| C09FD | TABLES Table, occasional, round, 405 × 600 mm diameter |
| C09FE | TABLES Table, coffee, 300 × 600 × 600 mm, modular unit |
| C09JK | TABLES Table, transfer, bottled fluids, loading truck |
| C09JL | TABLES Table, laboratory balance |
| C10CA | WORKTOPS 600 mm wide, 500 mm length |
| C10CB | WORKTOPS 600 mm wide, 600 mm length |
| C10CC | WORKTOPS 600 mm wide, 1200 mm length |
| C10CD | WORKTOPS 600 mm wide, 1300 mm length |
| C10CE | WORKTOPS 600 mm wide, 1400 mm length |
| C10CF | WORKTOPS 600 mm wide, 1500 mm length |
| C10CG | WORKTOPS 600 mm wide, 1600 mm length |
| C10CH | WORKTOPS 600 mm wide, 1700 mm length |
| C10CI | WORKTOPS 600 mm wide, 1800 mm length |
| C10CJ | WORKTOPS 600 mm wide, 1900 mm length |
| C10CK | WORKTOPS 600 mm wide, 2000 mm length |
| C10CL | WORKTOPS 600 mm wide, 2100 mm length |
| C10CM | WORKTOPS 600 mm wide, 2200 mm length |
| C10CN | WORKTOPS 600 mm wide, 2300 mm length |
| C10CO | WORKTOPS 600 mm wide, 2400 mm length |
| C10CP | WORKTOPS 600 mm wide, 2500 mm length |
| C10CQ | WORKTOPS 600 mm wide, 2600 mm length |
| C10CR | WORKTOPS 600 mm wide, 2700 mm length |
| C10CS | WORKTOPS 600 mm wide, 2800 mm length |
| C10CT | WORKTOPS 600 mm wide, 2900 mm length |
| C10CU | WORKTOPS 600 mm wide, 3000 mm length |
| C10DA | WORKTOPS 500 mm wide, 500 mm length |
| C10DB | WORKTOPS 500 mm wide, 600 mm length |
| C10DC | WORKTOPS 500 mm wide, 1200 mm length |
| C10DD | WORKTOPS 500 mm wide, 1300 mm length |
| C10DE | WORKTOPS 500 mm wide, 1400 mm length |
| C10DF | WORKTOPS 500 mm wide, 1500 mm length |
| C10DG | WORKTOPS 500 mm wide, 1600 mm length |
| C10DH | WORKTOPS 500 mm wide, 1700 mm length |
| C10DI | WORKTOPS 500 mm wide, 1800 mm length |
| C10DJ | WORKTOPS 500 mm wide, 1900 mm length |
| C10DK | WORKTOPS 500 mm wide, 2000 mm length |
| C10DL | WORKTOPS 500 mm wide, 2100 mm length |
| C10DM | WORKTOPS 500 mm wide, 2200 mm length |
| C10DN | WORKTOPS 500 mm wide, 2300 mm length |
| C10DO | WORKTOPS 500 mm wide, 2400 mm length |
| C10DP | WORKTOPS 500 mm wide, 2500 mm length |
| C10DQ | WORKTOPS 500 mm wide, 2600 mm length |
| C10DR | WORKTOPS 500 mm wide, 2700 mm length |
| C10DS | WORKTOPS 500 mm wide, 2800 mm length |
| C10DT | WORKTOPS 500 mm wide, 2900 mm length |
| C10DU | WORKTOPS 500 mm wide, 3000 mm length |
| C10EA | WORKTOPS 700 mm wide, 500 mm length |
| C10EB | WORKTOPS 700 mm wide, 600 mm length |
| C10EC | WORKTOPS 700 mm wide, 1200 mm length |
| C10ED | WORKTOPS 700 mm wide, 1300 mm length |
| C10EF | WORKTOPS 700 mm wide, 1500 mm length |
| C10EG | WORKTOPS 700 mm wide, 1600 mm length |
| C10EI | WORKTOPS 700 mm wide, 1800 mm length |
| C11AA | LABORATORY PH Meter |
| C11AB | LABORATORY Balance analytical, single pan, 160 gm |
| C11AD | LABORATORY Balance analytical, single pan, 600 gm |
| C11AE | LABORATORY Balance, top pan, 4 kilo |
| C11AF | LABORATORY Water bath |
| C11AG | LABORATORY Minor centrifuge |
| C11AH | LABORATORY Pipette washer |

| "B" Sheet Code No | Activity Unit Title |
|---|---|
| C11AJ | LABORATORY Draining rack |
| C11AK | LABORATORY Balance, top pan, 100 gramme |
| C12CA | DISPOSAL CONTAINERS Holder, sack, small, free standing |
| C12CB | DISPOSAL CONTAINERS Holder, sack, medium, free standing |
| C12CC | DISPOSAL CONTAINERS Holder, sack, large, free standing |
| C12DA | DISPOSAL CONTAINERS Holder, sack, foot operated, free standing |
| C12DC | DISPOSAL CONTAINERS Holder, sack, large, foot operated, free standing |
| C12EC | DISPOSAL CONTAINERS Sack holder, mobile, large |
| C12GB | DISPOSAL CONTAINERS Bin, disposal, general purpose, with liner, mobile |
| C12GD | DISPOSAL CONTAINERS Bin, flammable waste, liquid tight, with hinged lid |
| C12GF | STORAGE Bin, radioactive contaminated materials |
| C13CB | BOOK STORAGE Bookcase, standing, 1200 mm long, wood door, 3 shelves |
| C13CC | BOOK STORAGE Bookcase, 1200 mm long, open, 3 shelves, cupboard under |
| C13CD | BOOK STORAGE Bookcase, 1200 × 1000 × 400 mm, glass doors, cupboard under |
| C13DA | BOOK STORAGE Bookshelves, island, double, 4 shelves, 1800 × 1800 × 450 mm |
| C13EA | BOOK STORAGE Rack, magazine, 1400 × 900 × 300 mm, 3 shelves, wall mounted |
| C13EB | BOOK STORAGE Magazine rack, double-sided, 1350 × 900 × 600 mm |
| C14AA | DRAWERS/CUPBOARDS Cupboard, 800 × 600 × 500 mm, 2 shelves adjustable |
| C14AB | DRAWERS/CUPBOARDS Drawer unit, melamine faced, 5 drawer, 800 × 600 × 500 mm |
| C14AC | DRAWERS/CUPBOARDS Cupboard metal, flame resistant, 710 × 890 × 480 mm, lockable |
| C14AD | CUPBOARD Cupboard, 800 × 1200 × 500 mm, lockable |
| C15AA | PHARMACY PROCESSING Heated ointment slab |
| C15AB | PHARMACY PROCESSING Filling machine, hand operated |
| C15AC | PHARMACY PROCESSING Tube crimping machine, hand operated |
| C15AD | PHARMACY PROCESSING Planetary mixer, bench model |
| C15AE | PHARMACY PROCESSING Bath water, electric, 6 hole |
| C15AF | PHARMACY PROCESSING Ampoule washing machine |
| C17CA | MIRRORS Mirror, wall mounted, 1500 × 400 mm |
| C17CB | MIRRORS Mirror, wall mounted, 600 × 300 mm |
| C18CA | DISPLAY PANEL Panel, display wall mounted, 800 × 600 mm |
| C18CB | DISPLAY PANEL Panel, display wall mounted, 800 × 1200 mm |
| C20CB | MARKER BOARDS Wall mounted, 800 × 1200mm |
| C21AA | WEIGHING/MEASURING Tablet and capsule counter, electrical |
| C21AB | WEIGHING/MEASURING Scales, dispensing |
| C21AC | WEIGHING/MEASURING Scales, self-indicating, recessed platform |
| C23CA | DOCUMENT STORAGE Cabinet, filing, 2 drawer |
| C23CB | DOCUMENT STORAGE Cabinet, filing, 4 drawer |
| C23DC | DOCUMENT STORAGE Card index, 4 drawer |
| C23DD | DOCUMENT STORAGE Card index, 8 drawer, without lock |
| C23EB | DOCUMENT STORAGE Card index, cabinet stand, 450 × 450 × 450 mm |
| C23ED | DOCUMENT STORAGE Card index, cabinet stand, 900 × 450 × 450 mm |
| C23FB | DOCUMENT STORAGE Visible record cabinet, 18 tier and stand, lockable, mobile, rotating |
| C23ID | DOCUMENT STORAGE Cabinet, visible record, vertical rotary, 5 tier |
| C27CB | STOOLS/RESTS Stool, metal frame, 710 mm, upholstered |
| C27CD | STOOLS/RESTS Stool, kick, retractable castors |
| C30AA | HAND TRUCKS Electric, distribution, low loading, small |
| C30AB | HAND TRUCKS Distribution truck, low loading, small |
| C30AC | HAND TRUCKS Truck, sack |
| C30AE | HAND TRUCKS Truck, pallet lifting |

LIST OF ACTIVITY UNIT DATA "B" SHEETS

| "B" Sheet Code No | Activity Unit Title |
|---|---|
| C30AF | HAND TRUCKS Trolley, drum handling |
| C30AG | HAND TRUCKS Cart, refuse |
| C30AH | HAND TRUCKS Refuse, trolley |
| C31CB | TROLLEYS Trolley, general purpose, 965 × 915 × 455 mm, 3 tier, buffered |
| C31CH | TROLLEYS Trolley, dressing/instrument, SS, 750 × 450 mm, buffered |
| C31CI | TROLLEYS Trolley, dressing/instrument, SS, 450 × 450 mm, buffered |
| C31CJ | TROLLEYS Instrument, SS, A/S castors, 870 × 1050 × 600 mm |
| C31CL | TROLLEYS Supermarket type |
| C31FF | TROLLEYS Library |
| C31GE | TROLLEYS Soiled linen, single ring BS 2854 |
| C31KF | TROLLEYS Trolley, cleaners |
| C31KN | TROLLEYS Transfer trolley, bottled fluids, sterilizer with S/S loading truck 28 cu ft |
| C32CB | RACKING Metal, 1 bay, 4 shelves, 1800 × 900 × 450 mm |
| C32CC | RACKING Metal, 1 bay, 4 shelves, 1800 × 900 × 600 mm |
| C32CD | RACKING Metal, 1 bay, 2 shelves, 1800 × 1200 × 450 mm |
| C32CG | RACKING Metal, 1 bay, 4 shelves, 2000 × 914 × 305 mm |
| C32CH | RACKING Metal, 1 bay, 4 shelves, 2000 × 914 × 600 mm |
| C32CI | RACKING Metal, 1 bay, 4 shelves, 2000 × 914 × 457 mm |
| C32CL | RACKING Metal, 2 bays, 4 shelves, 200 × 1828 × 300 mm |
| C32CM | RACKING Metal, 2 bays, 4 shelves, 2000 × 1828 × 457 mm |
| C32CN | RACKING Metal, 3 bays, 4 shelves, 2000 × 2742 × 305 mm |
| C32DH | RACKING Free standing, steel mesh shelves, 4 shelves, 1800 × 1800 × 450 mm |
| C32DM | RACKING Softwood, 2000 × 1600 × 450 mm |
| C33DA | SHELVING Square ends, 900 × 200 mm |
| C33DB | SHELVING Square ends, 900 × 300 mm |
| C33EB | SHELVING Shelf, square ends, 1200 × 300 mm |
| C33FB | SHELVING Shelf, square ends, 1500 × 300 mm |
| C33NB | SHELVING Shelf, wall mounted, adjustable, PVC coated steel,perforated, 1500 × 600 mm |
| C34AA | PALLET Storage, reversible, 1000 × 1200 mm |
| C34AB | PALLETS Platform, 300 × 900 × 900 mm |
| C35AA | TANK Mobile, S/S, 30L |
| C35AB | TANK Mobile, S/S, 60L |
| C35AC | TANK Mobile, S/S, 100L |
| C35AD | TANK Mobile, S/S, 150L |
| C35AE | TANK Mobile, S/S, 240L |
| C36AA | GOODS HANDLING Gravity feed conveyor, S/S, lm |
| C36AB | GOODS HANDLING Loading bay lift, mobile |
| C38BA | REFRIGEREATED STORAGE Refrigerator: Radiopharmaceutical materials |
| C38CJ | REFRIGERATED STORAGE Refrigerator 20 cu ft, lockable, external temperature gauge |
| C38DB | REFRIGERATED STORAGE Refrigerator, drugs, 1 cu ft, wall mounted |
| C38FB | REFRIGERATED STORAGE Cabinet, deep freeze, 6 cu ft |
| C38HO | REFRIGERATED STORAGE Refrigerator, drugs, floor mounted, 4 cu ft |
| C38HX | REFRIGERATED STORAGE Refrigerator, 4 cu ft, reagents |
| C38JA | REFRIGERATED STORAGE Freezer, 2 cu ft, bench mounted |
| C52CE | DOMESTIC CLEANING Cleaner, suction, wet/dry, with hose |
| C52EA | DOMESTIC CLEANING Trolley, bucket, wringer |
| C52EC | DOMESTIC CLEANING Machine, dry suction, industrial cylinder |
| C52EG | DOMESTIC CLEANING Machine, scrubbing, polishing, industrial |
| C52EH | DOMESTIC CLEANING Machine, wet/dry suction, industrial |
| C59CA | FIRE FIGHTING Blanket, fire & container, 370 × 525 × 95 mm |
| C59DA | FIRE FIGHTING Hose, fire and reel, with cold water outlet |
| C59EA | FIRE FIGHTING Extinguisher, fire, foam, 9.09 ltr, wall mounted |
| C59EB | FIRE FIGHTING Extinguisher, fire, water, 9.09 ltr, wall mounted |
| C59EH | FIRE FIGHTING Extinguisher, fire, $CO_2$, 4.5 kg, wall mounted |
| C59EK | FIRE FIGHTING Extinguisher, fire, dry powder, 2.7 kg, wall mounted |

# Appendix 1

## Glossary

**Antibiotic**
Descriptive term of a therapeutic agent used to combat an infection of bacterial origin.

**Antiseptic**
A chemical agent used to destroy or inhibit micro-organisms on living tissue (but not a synonym for disinfectant).

**Apyrogenic**
Free of contamination of pyrogens. (To produce apyrogenic distilled water requires specially designed stills.)

**Aseptic**
Literally, lack of sepsis. Refers to procedures etc designed to exclude or minimise contamination by micro-organisms.

**Aseptic room**
A room with a Clean Area designed, constructed, serviced and used with the intention of preventing microbial contamination of the product.

**Aseptically prepared**
A product prepared using aseptic procedures.

**Capsule**
A particular solid dose form of a medicine in which the active material is enclosed within a (usually) torpedo-shaped gelatin coat.

**Child resistant pack**
Medicine packed in such a way as to make the package resistant to opening by a child (often seen in the form of special caps on glass bottles).

**Clean Area**
A room or suite of rooms with defined environmental control of particulate and microbial contamination, constructed and used in such a way as to reduce the introduction, generation and retention of contaminants within the area.

**Closure**
Seal to a bottle etc; refers to wad, screw-cap, overcap, etc as appropriate.

**Container**
For the purposes of this note this refers to the immediate packing of a product eg glass bottle for liquid, plastic vial for solid preparation.

**Controlled Drugs**
Medicines and drug materials controlled under the Misuse of Drugs Act 1971 and Regulations (superseding Dangerous Drugs Acts and Regulations).

**Cream**
A particular semi-solid form of presentation of a medicine in which the active material is contained in an oil in water emulsion.

**Disinfectant**
A chemical agent used for disinfection - ie destruction of micro-organisms - on inanimate objects and materials or skin and other body membranes and cavities.

**Dressings**
Products for application to the body for the purpose of wound protection, occlusion, etc. Generally fabric materials but including cotton wool and more modern synthetic products.

**Drugs**
Substances from plant or animal origin, or other materials having a therapeutic effect not yet made up into final presentation as a medicine.

**Drugs liable to misuse**
Includes Controlled Drugs and other products of which there is a suspicion of misuse but which may not be otherwise so strictly controlled by legislation.

**Entonox**
Propriety medical gas consisting of a 50:50 mixture of nitrous oxide and oxygen supplied in cylinders.

**Extemporaneous preparation**
Preparing products from raw materials "according to the art", with the application of specialist skills and techniques, as and when required, rather than drawing from previously manufactured stock.

**Finished product**
For the purposes of this Note, a product which has undergone all stages of manufacture, including packaging.

**Infusion fluids**
Sterile medicinal products for infusion into the patient's blood stream.

**Inhalation**
A medicine intended to be inhaled by the patient.

**Medical Gas**
A gas used for medical purposes such as pain relief by inhalation. These gases are available in cylinders or from liquid bulk storage tanks when used in large volumes. Cylinders of different gases are differentiated from each other by colour coding.

**Medication cart**
A special trolley with facilities for storing medicines in separate drawers or compartments for individual patients.

The draws/compartments are often grouped for removal/replacement when they are termed cassettes. (This contrasts with the British Standard ward medicine trolley which is normally used to store medicine in stock bottles or individual patients' bottles).

**Medicinal products**
Substances or articles for adminstration to humans or animals for medicinal purpose (treating disease, diagnosis, contraception, anaethesia etc) or an ingredient in the preparation of something to be administered for medicinal purposes (see Section 130 of the Medicines Act 1968).

**Medicines Act 1968**
The primary legislation controlling preparation and dealing in medicinal products which set up a licensing system for marketed medicines and different categories of them for retail sale purposes, together with a Medicines Commission to advise Ministers.

**Medicines Inspectors**
Inspectors appointed to inspect the premises and procedures of a manufacturer or assembler of medicinal products and wholesalers. They are employed in the Medicines Division of DHSS

**Microbiological media**
Nutrients in solid or liquid form to support growth of colonies of bacteria and other micro-organisms.

**Misuse of Drugs Act 1971**
The legislation exerting additional controls on "dangerous" medicines and drugs which may be misused.

**Noel Hall area**
Geographical organisation of the hospital pharmaceutical services, based upon recommendations of the Noel Hall Report.

**Noel Hall Report**
This report recommended an area based structure of the hospital pharmaceutical services and the appointment of a pharmacist to the regional level. The report's full title is "The report of the Working Party on the Hospital Pharmaceutical Services" and was published in 1970.

**Ointment**
A particular semi-solid form of presentation of a medicine in which the active material is contained in a water in oil emulsion.

**Particulate contamination**
In this context contamination of liquid medicines by particles of solid matter of any size; standards for infusion fluids are based upon particles of $2\mu$ or greater.

**Pass through hatch**
A double sided cupboard (usually small) which is used for the transfer of materials or equipment in or out of a room with a controlled environment.

**Penicillins**
A group of antibiotic drugs which can produce, often in minute doses, sensitivity reactions in susceptible people.

**Pharmaceutical**
Adjective pertaining to pharmacy.

**Pharmacokinetics**
The study of the relationship between absorption, distribution, metabolism, excretion, effects and duration of action of a drug.

**Pharmacy**
The science and art of preparing and distributing medicines and the information relating thereto.

**Point loading**
Where the weight of an object is borne by only part of the object (ie legs) a heavier weight per unit area would occur on the floor than if the object rested with one complete side on the floor.

**Prepacks**
Medicines packed in a form ready for issue without further manipulation of the pack's contents. (May also be unit of use pack in some cases).

**Primary services**
For the purpose of this Note, patient-orientated activities of a hospital pharmacy such as dispensing, supply of ward drugs, information and other activities performed directly for individual patients.

**Product Licence**
A licence required under the Medicines Act before a medicinal product can be marketed.

**Production consumables**
Items in a production process which, although not entering into the final product, cannot be used again (eg filter papers).

**Pyrogens**
Agents, derived from the breakdown of bacteria, which cause raised temperature or fever when injected into the blood stream.

**Radiopharmaceuticals**
Medicinal products which achieve their purpose by virtue of radioactivity. May be used for therapy or, more commonly, diagnosis.

**Raw materials**
Basic starting materials which are incorporated into the final product in a production process, eg powdered ingredients.

**Reference samples**
Samples of a raw material or finished product which are held as a reference should there need to be any further testing during the shelf life of the product.

**Sera**
Medicinal products prepared from the blood of living animals (eg horses, humans) to treat particular infections or poisonous snake bites.

**Sterile**
Containing no living organisms. For the purposes of the Note, sterile describes a material or product which has undergone a successful sterilization process (ie a process to remove or destroy all living organisms) and has not been subsequently contaminated.

**Steroid**
One of a particular family of compounds based on a common molecular structure; some of these potent compounds occur naturally in different parts of the body, where they have been called "chemical messengers".

**Strip packs**
A presentation of solid dose medicines with each unit (eg tablet) packed in a "bubble" on a laminated strip.

**Support services**
For the purposes of this Note, hospital pharmaceutical activities which support the primary services which operate on a larger scale than supplying for an individual patient, eg manufacturing in bulk.

**Suppository**
A particular form of presentation of a medicine in which the active material is contained within a torpedo-shaped base for insertion into the rectum, the base being solid at room temperature but melting at body temperature.

**Tablet**
A particular solid dose form of a medicine in which the active material is presented in a small compressed disc of powder or granulated material.

**Topical fluid**
A medicinal product, normally sterile, for application to a patient's skin.

**Unit of use pack**
Overall term for medicine presented in a pack containing only that quantity required for a single administration.

**Vaccine**
A medicinal product prepared from killed or attenuated bacteria or viruses to raise a patients immunity to those diseases.

**Ward pharmacist**
A pharmacist whose duties include regular visiting of a particular ward to check prescription sheets, ensure supply of required medicines, and advise medical and nursing staff.

**Wild heat**
Uncontrolled heat given out suddenly during or at the end of a process, such as when an autoclave door is opened after steam sterilization.

# Appendix 2

HEALTH CIRCULAR HC(84)3

DEPARTMENT OF HEALTH AND SOCIAL SECURITY

| | | |
|---|---|---|
| To: | Regional Health Authorities<br>District Health Authorities<br>Special Health Authorities for London<br>Postgraduate Teaching Hospitals<br>Boards of Governors<br>Central Blood Laboratories Authority<br>Public Health Laboratory Service Board | for action |
| | Family Practitioner Committees<br>Community Health Councils | for information |

January 1984

HEALTH SERVICES MANAGEMENT:

MANUFACTURE OF PRODUCTS IN THE NHS

## SUMMARY

This Circular introduces a policy designed to ensure that the manufacture of products by the NHS takes account of the cost of making them compared with that of buying them in.

## INTRODUCTION

1. Ministers are anxious that, as a general rule, the NHS should manufacture products only when it is clearly more economical to do so than buying them in, or when no suitable product is otherwise available. The policy has been developed following wide consultation which included the NHS, the pharmaceutical industry, the British Health Care Trade and Industry Council and other bodies. The Health Service Supply Council has considered the policy and strongly commends the guidance set out below. This Circular replaces guidance in the Department's letter of 11 August 1977 to Regional Administrators (reference: G/P25/137), which applied only to the manufacture of sterile fluids.

## SCOPE OF POLICY

2. The underlying principle is that the NHS should engage in manufacture only if:

   i. there is no satisfactory commercial source or

   ii. it is significantly more economical to do so.

3. The policy covers:

   i. pharmaceutical products for medical use, but excluding those derived from human tissue including blood;

   ii. reagents for laboratory use - but excluding those derived from human tissue including blood - where it is clear that a commercial product would meet the need currently met by a NHS product;

   iii. medical equipment and supplies for life support, diagnostic, therapeutic and rehabilitation purposes, but excluding certain items explained in paragraph 4 below and other items of a similar nature.

It does not apply to standard and other reference materials for which, by definition, there could be no satisfactory substitute.

4. The policy applies to all NHS hospital manufacturing units. "Manufacturing" in this context includes assembly in CSSD's of industrially made components into packs or kits with subsequent processing but does not include:-

   i. any manipulation performed on a pharmaceutical product in a hospital ward, department or clinic immediately prior to administration to a patient;

ii. the preparation in a hospital, by or under supervision of a pharmacist, of medicines which are to be administered to one or more named patients on the prescription of a duly registered medical or dental practitioner within a reasonable time after preparation in relation to the known or estimated risks of deterioration*;

iii. dressing packs assembled by patients under conditions satisfying the appropriate Guide to Good Manufacturing Practice;

iv. work carried out in occupational and industrial therapy, chiropody and physiotherapy departments, in orthopaedic appliance laboratories, rehabilitation engineering workshops, orthopaedic workshops.

v. university units supplying reagents to hospitals at no cost to the NHS;

vi. the preparation of reagents from stock in a hospital department for immediate or short term use.

## COMPARISON OF COSTS

5. Where manufacturing is carried out it is essential that the full cost of the operation be established not only for internal information and to determine realistic prices for inter-authority transactions, but also to ensure proper comparisons with outside prices where appropriate. For this purpose memorandum manufacturing and profit and loss accounts should be prepared covering not only direct manufacturing costs but also overheads, cost of capital, back-up services, documentation, etc.

6. It so happens that since April 1982 the South Western Regional Health Authority has been introducing a costing system applicable to the manufacture of pharmaceutical products. Details of this system are being issued separately in a Financial Matters Bulletin to Treasurers so that other authorities can take this development work into account in preparing their own costings and comparisons. The possibility of adopting a standard system nationally will be considered in the light of experience.

7. Authorities should monitor the results of costing and take appropriate action. Detailed guidance is given in the Appendix to this Circular. Arrangements will be subject to examination by statutory auditors in the usual way.

## FACTORS OTHER THAN COST

8. When considering NHS manufacture as an alternative to purchase, factors other than cost should be taken into account such as the specification of products, possible patent infringements training needs and ease and continuity of supply. Authorities must however ensure that:

i. they make a valid comparison; and

ii. any minor variations in specification are justified (see Appendix, paragraph 1(iv)).

9. Products manufactured in the NHS should always comply with any applicable British or European Pharmacopoeia, or British or International Standard, as should the components and materials used in the process. Manufacturing procedures should accord with relevant Guides to Good Manufacturing Practice where they exist. Additionally, any premises used should comply with the standards outlined in appropriate Departmental Building Guidance such as the Pharmaceutical Department Building Note.

10. These conditions must be met before cost comparisons are made or else the cost of meeting them must be taken fully into account.

## ACTION

11. Authorities should take immediate steps to initiate the implementation of this policy.

**From: Health Services Division 1B**
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**Hannibal House**
**Elephant and Castle**
**LONDON SE1 6TE**

**Tel. 01-703 6380 Ext 3335**

**DUD/1/17**

**Further copies of this Circular may be obtained from DHSS Store, Health Publications Unit, No 2 Site, Manchester Road, Heywood, Lancs OL10 2PZ quoting code and serial number appearing at top right hand corner.**

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* **This will also allow the normal research and development work carried out in some hospital pharmacies to be adequately undertaken in co-operation with the medical staff.**

## MANUFACTURE OF PRODUCTS IN THE NHS

### 1. EXISTING UNITS

Existing units should be reviewed as follows:

i. The Department is anxious that the rationalisation of NHS manufacture should, as soon as possible, be considered by Health Authorities on a regional and supra-regional basis, even where there are already grounds for continuing it. Therefore, RHAs should instigate and monitor a costing exercise in DHAs with manufacturing units and after consultation with receiving DHAs take account of the possibility of reducing the cost of NHS manufacture by the merging of two or more manufacturing units. If a costing is not made, it must be presumed that NHS manufacture will not continue.

ii. Where a satisfactory commercial source exists, and an economic assessment shows that rationalised NHS manufacture does not carry a clear economic advantage, NHS manufacture should cease. It may however be desirable - particularly in the short term - to retain an NHS manufacturing unit when account is taken of the capital investment already made or the lower 'alternative use' value of the facilities. There may be manufacturing facilities which in the short term are commercially viable when looked at on a marginal cost basis (that is, when the purchase of products outside would cost more than would be saved by discontinuing in-house production); but in the longer term, as existing plant wears out or alternative uses become available from premises in which manufacturing takes place, the situation may change and commercial purchase may then be justified.

iii. If no satisfactory commercial product can be found then NHS manufacture should continue, bearing in mind the need for efficiency. This could mean the rationalisation of manufacture; switching to supplies from another NHS source or increased capital or revenue expenditure to achieve an overall increased benefit.

iv. Sometimes a commercial pharmaceutical product may not appear to be suitable because of the particular specification requested. There are however, commercial sources prepared and licensed to manufacture 'specials'. Health Authorities should undertake their own assessment of the ability of such commercial sources to meet the packaging quality and delivery time requirements of their services. While the Department remains of the opinion that no decision on the necessity of using particular medicines in the NHS should be proposed or enforced, authorities are urged to continue to develop - through drug and therapeutic committees - local drug-use policies which, by fostering more rational prescribing practices and seeking justification for apparently minor variations to established products, should progressively result in fewer non-standard preparations.

v. Where NHS manufacture continues, there should be regular costing, a check of other factors and reconsideration whether continued manufacture is justified.

### 2. PROPOSED NEW FACILITIES (OR PROPOSED ENHANCEMENTS)

i. Before proceeding with new facilities the possibility of obtaining supplies from a commercial or another NHS source should be considered.

ii. If the provision of new manufacturing facilities (or the enhancement of existing facilities) is considered, authorities should first carry out a capital investment appraisal using the techniques set out in the Treasury booklet on "Investment Appraisal in the Public Sector" copies of which were distributed to all Treasurers under cover of Financial Matters Bulletin June 82. Some additional information is provided in HN(82)34.

iii. If it appears that the NHS can make products more cheaply than the commercial supplier, the possibility of a reduction in the commercial price should be explored before the decision to manufacture is considered. Although such preliminary enquiries may be made by professional and technical staff the advice of a Supplies Officer should be sought at an early stage and he should handle any formal arrangements. Only if worthwhile savings are clearly indicated after thorough analysis, or there are other good reasons, should the provision of NHS manufacturing facilities be considered.

iv. In the apparent absence of a commercial source authorities should consult the Regional Pharmaceutical Officer and Regional Supplies Officer (or other appropriate persons for advice on supplies other than drugs and pharmaceuticals). If there is no satisfactory existing or potential commercial source, then the provision of NHS manufacturing facilities may be considered. (But see also paragraph 1(iv) of this Appendix.)

v. Once manufacture has started, there should be regular costing and checks as at paragraphs 1(v) of this Appendix.

# Appendix 3

## Critical Dimensions

### Introduction

1. Critical dimensions are those dimensions which are critical to the efficient functioning of an activity; thus the size of components, their position and the space around them may all be critical to the task being performed. Guidance on these dimensions for a particular activity is provided in the form of *component-user data sheets*. These illustrate components, ie equipment, furniture and fittings, and provide ergonomic data on the space required for users to move, operate or otherwise use the component; information about the component, eg fixing heights, and the users, eg reach, is also provided. Component-user data sheets thus complement the information given on Activity Data 'B' sheets. (see Chapter 10)

2. This appendix contains sheets relevant to this Note. In addition, ergonomic data common to the design of a number of departments is contained in the *Common Activity Spaces* Health Building Note, to which reference should also be made.

### Component dimensions

3. These relate to the size and position of components as follows:

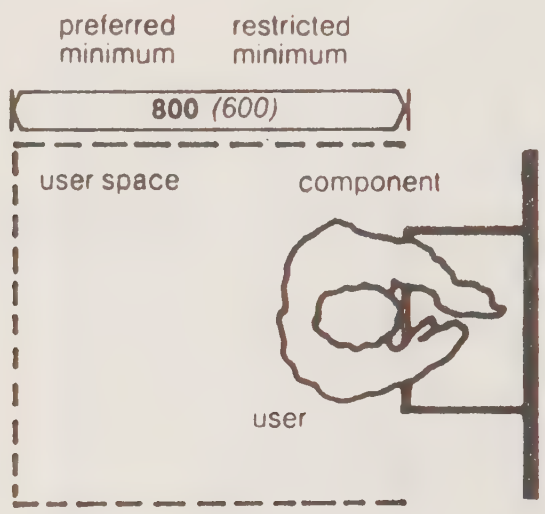
a. Sizes of components are shown thus

b. Preferred component fixing heights are shown as heights above floor level thus

(In some cases an acceptable range of fixing heights is also given in italics.)

### Activity dimensions

4. Activity dimensions define the user space, which is the minimum space required to perform an activity. Two types of activity dimension are given:

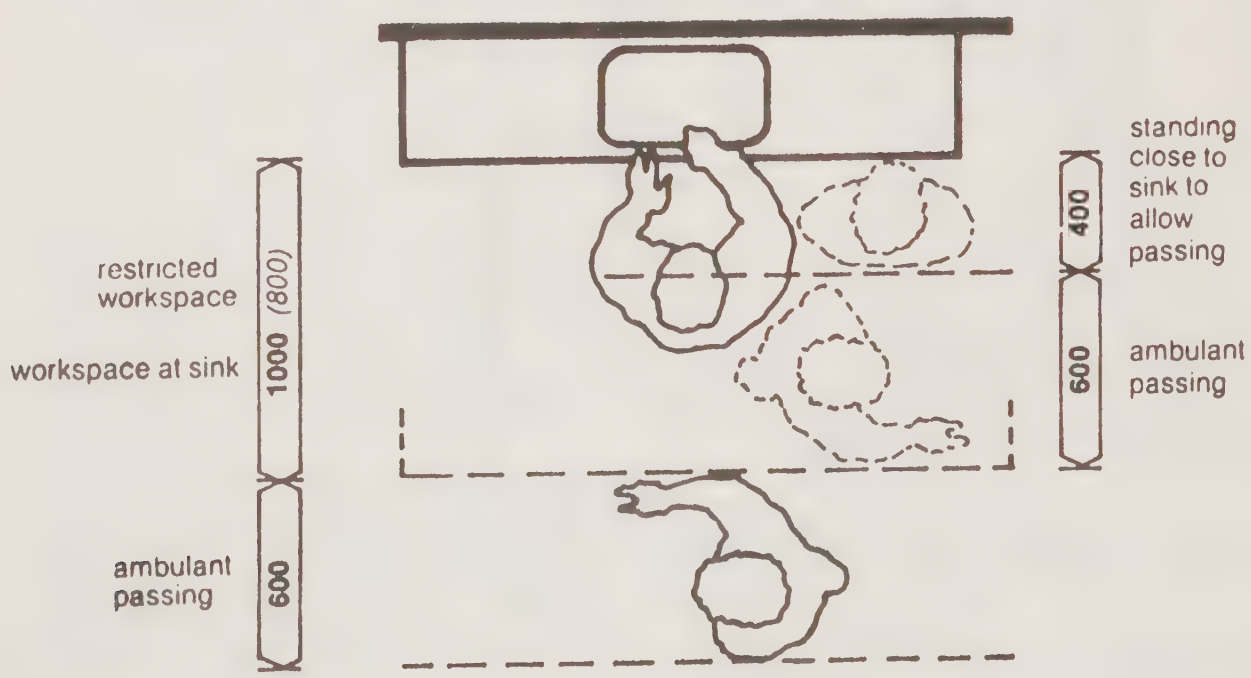



a. Preferred minimum—This defines the minimum space required to carry out an activity efficiently and is shown in bold type.

b. Restricted minimum—This will only allow the activity to be performed at the expense of the user experiencing some difficulty. It is not recommended for general application but may be appropriate when considering the overlapping that can be allowed when two user spaces are adjoining.

### Selection of activity dimensions

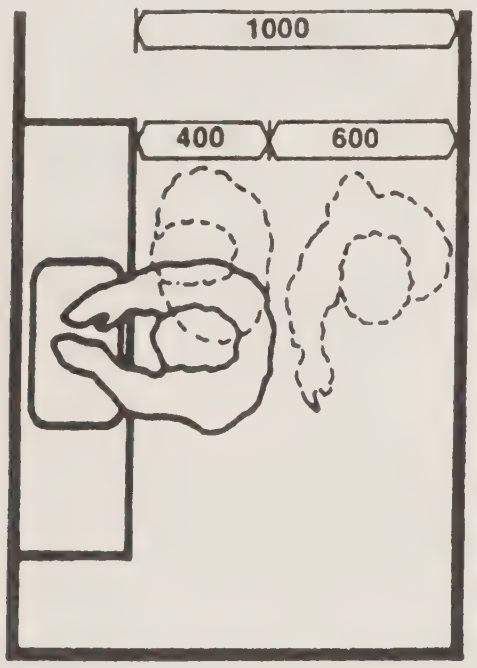
5. When using component-user data sheets to design activity space layouts, selection of the appropriate activity dimensions is essential for economy and efficiency. Selection should be based on careful consideration of the frequency, duration, timing and importance of the activities and also the number of people involved. A typical example of the use of a sink showing activity dimensions provided by the component user data sheet is shown below.



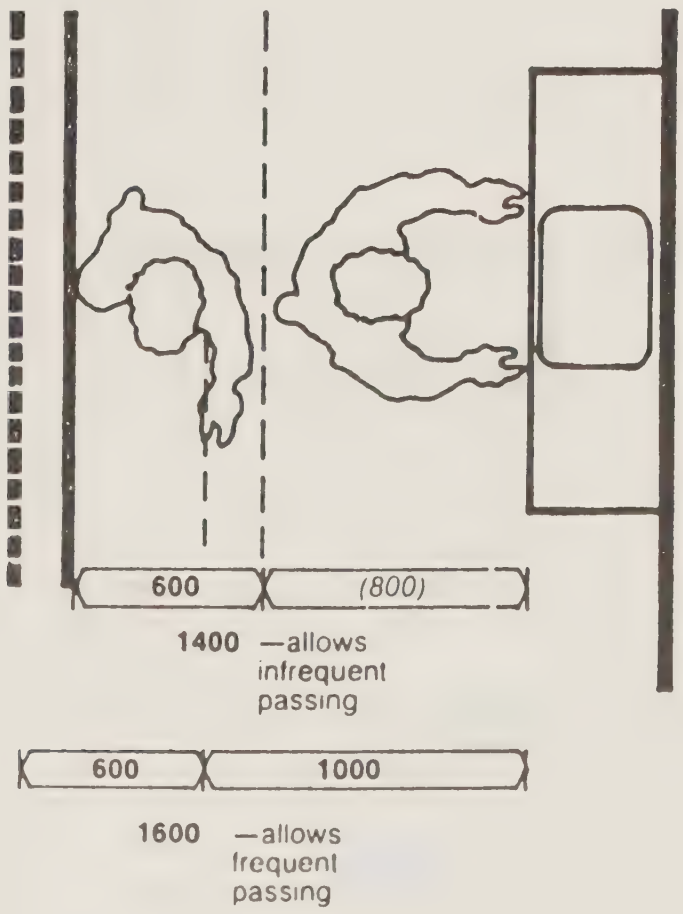
**Examples**

6. The following worked examples show the sink being used in 3 different situations and show how the appropriate dimensions would be selected. These examples have been simplified and additional factors such as the movement of mobile equipment may also be critical.

a. If the room is normally occupied by one person only the 1000 workspace dimension may be applicable. An (800) restricted dimension should not be used as this dimension is only applicable where two user spaces are adjoining, not where an individual user space is bounded by a wall or solid obstruction. If the person using the sink stops work and stands close to the sink, 1000 is also sufficient space to allow a second person to pass, ie 600 + 400.

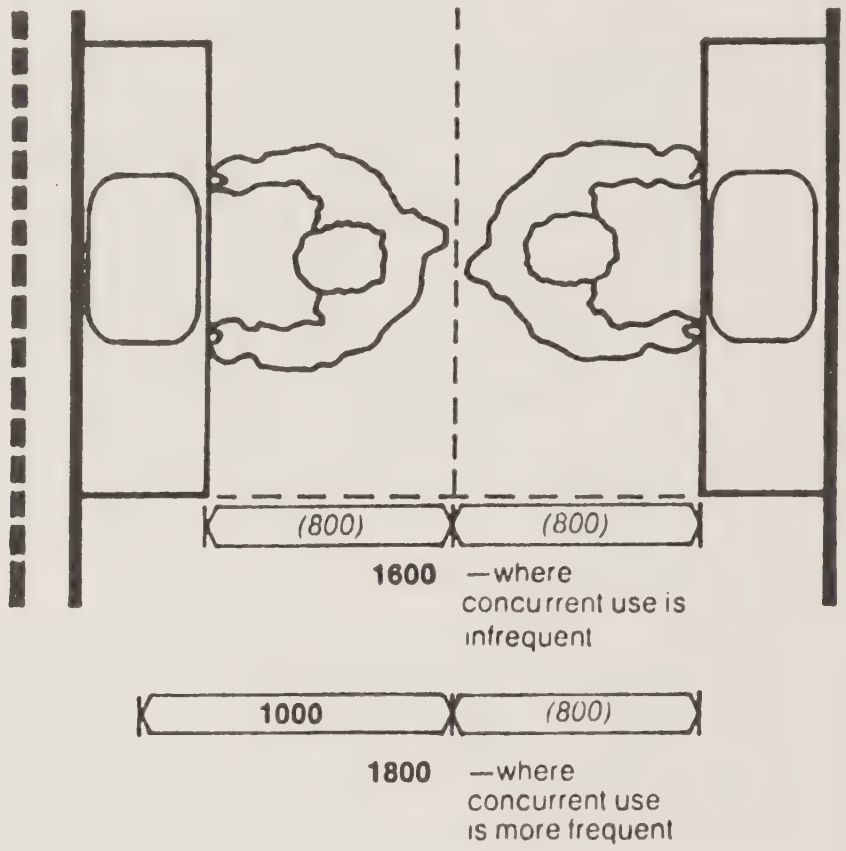



b. If space is required to allow a person to pass, without the user of the sink stopping work, then the 600 passing dimension is added to the workspace dimension. If passing is infrequent then temporary restriction of the sink user's space may be acceptable; this gives an overall dimension of 600 + (800) = 1400. If passing is frequent and restriction of the sink user's space is not acceptable the overall dimension is 600 + 1000 = 1600.




c. Where space has to be provided to enable two sinks to be used concurrently the overall dimension between sinks will be the sum of the workspace dimensions, eg if concurrent use is infrequent and of short duration then (800) + (800) = 1600 may be acceptable. Alternatively 1000 + (800) = 1800 allows the full workspace for one sink user and restricted space for the second user, where concurrent use of the sinks is more frequent.

Note. The passing of a third person between the two sink users may also be critical in this example. Where the sinks are staggered 1400 may be acceptable as in example b.




## LIST OF ERGONOMIC DRAWINGS

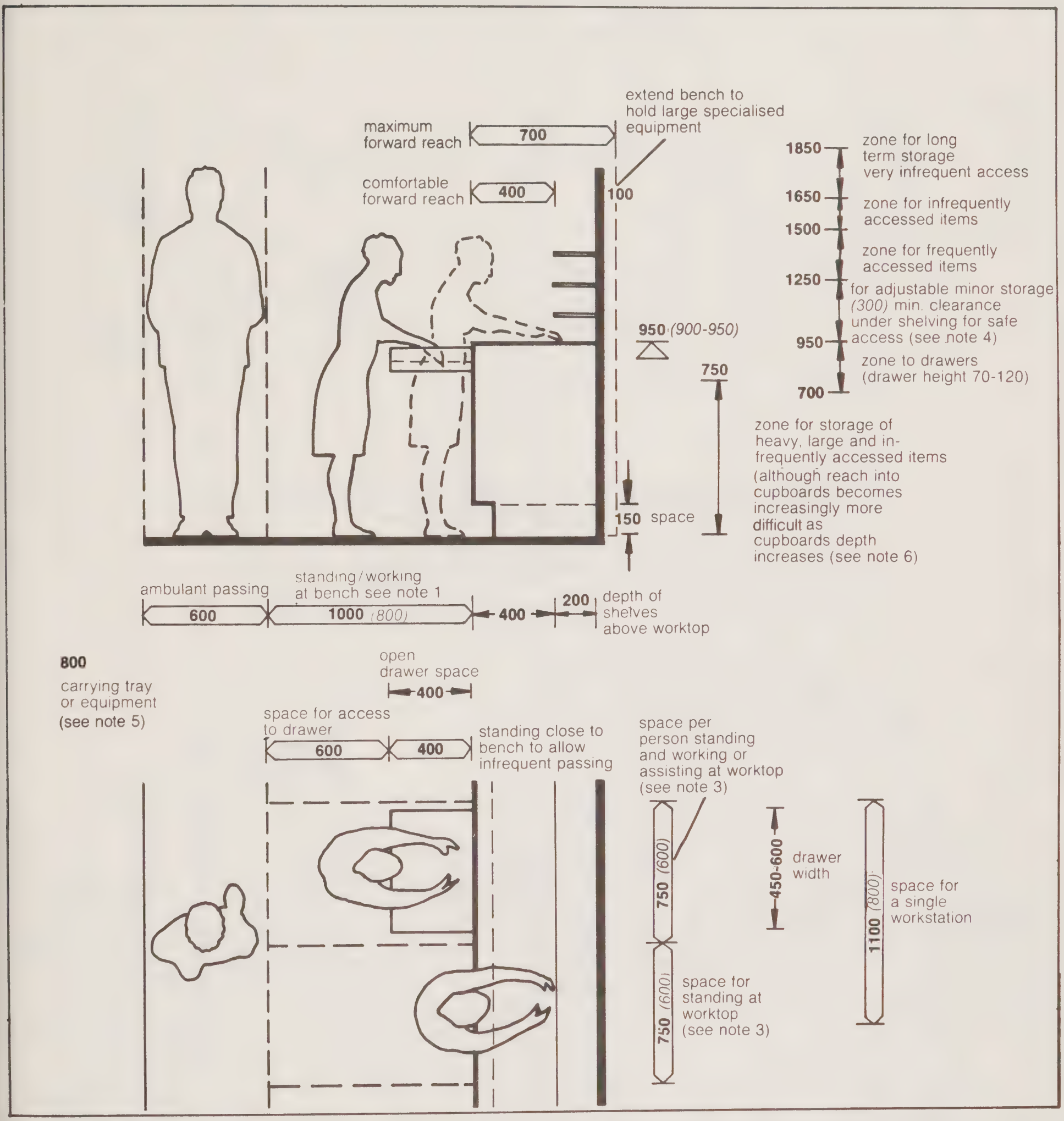
1. Worktop & Storage (Dispensary)
2. Pass-Through Hatch
3. Handwash Unit
4. Laminar Flow Cabinet
5. Liquid Inspection Viewer
6. Sterile Dispensing Suite
7. Cylinder Storage Rack

**Activities:**
dispensing - writing, counting tablets making up presciptions etc.
Storage of fluids, tablets and other pharmaceutical products.

DHSS **Ergonomic data bank:**
Component-user data sheet, not to scale

# Worktop & Storage (Dispensary)

**Users**
pharmacy staff.




**1350** *(1300)*

Preferred minimum: *Restricted minimum (not recommended for general use; see explanatory notes)*

1. 1000 is essential for comfortable working at most laboratory/light industrial type tasks. It allows the user to move and turn safely carrying liquids and small items of equipment, and it also allows infrequent ambulant passing when worker stands close to bench and kneeling access to stored items under worktop.

2. Shelf heights should be adjustable to allow adaptations to suit needs of individual work stations. Shelves above 1500 become increasingly less accessible to a small woman unless she stands on steps, and at 1950 small men can only reach the shelf standing on tip toe, thus shelves above 1500 should be used to store light, infrequently accessed items.

3. Pharmacy staff tend to stand at worktops since the nature of their duties dictates that they move around the dispensary. The dispensary tasks include getting small quantities of tablets/liquid/creams etc from containers and putting the correct amount into smaller bottles etc. for each individual prescription.

4. 300 is the minimum clearance under shelving for safe access to items stored at bench level. 400 may be required in some areas where a significant number of either the stored items or dispensing equipment is 200 or greater in height. This is not generally the case, however (see note 3 above), items tend to be small and carefully planned storage of small items may be possible in the area under the main shelving.

5. The larger allowance of 800 is essential to minimise accidents in large busy dispensaries.

6. Cupboards or shelves under worktop should preferably be not more than 400 *(500)* deep, and the intershelf space not less than the depth of the shelf immediately above.

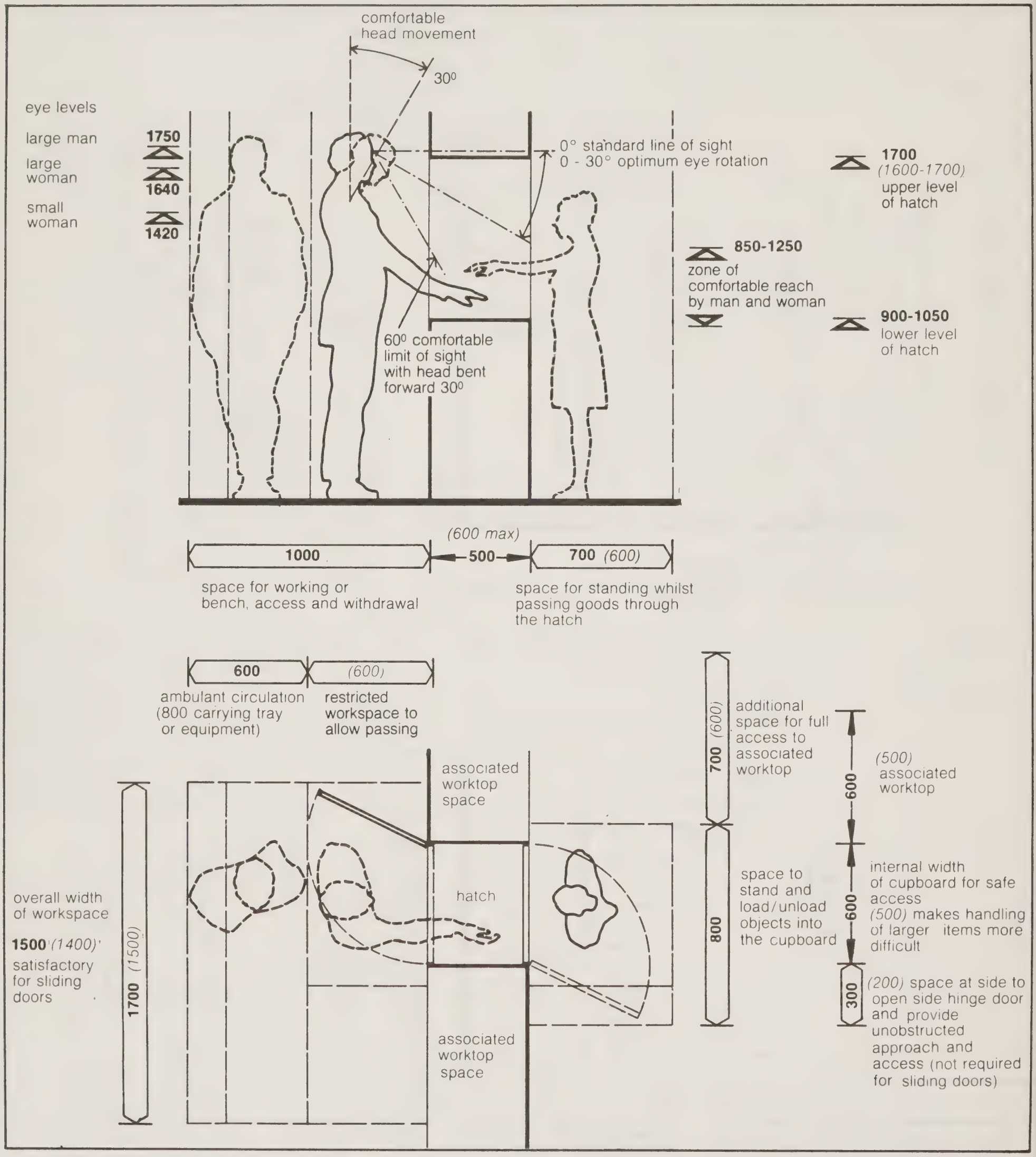
**Activities**
passing of containers, packs and small items of equipment from one area to another

DHSS **Ergonomic data bank**
Component user data sheet, not to scale

# Pass Through Hatch

double sided cupboard.

**Users:**
pharmacy staff




**1350** *(1300)*

Preferred minimum: *Restricted minimum (not recommended for general use; see explanatory notes)*

Notes:

1. The most comfortable zone of head movement is 0-30°, bending from the neck forwards. The most comfortable zone of eye movement is 25° above horizontal to 30° below. These together give a comfortable field of vision of 85° about the horizontal, and the work station should be within this field.

2. Worktops immediately in front of a pass-through hatch are not recommended, as they present reach problems and can also cause accidents, especially where hatch doors are hinged.

3. Pass-through hatch doors should preferably be made of glass to allow maximum visual communication from one side of cupboard to the other (to minimise the need for opening of doors and to reduce the likelihood of both doors being opened at once).

Doors can be hinged, opening outwards, or sliding - either horizontal or vertical.

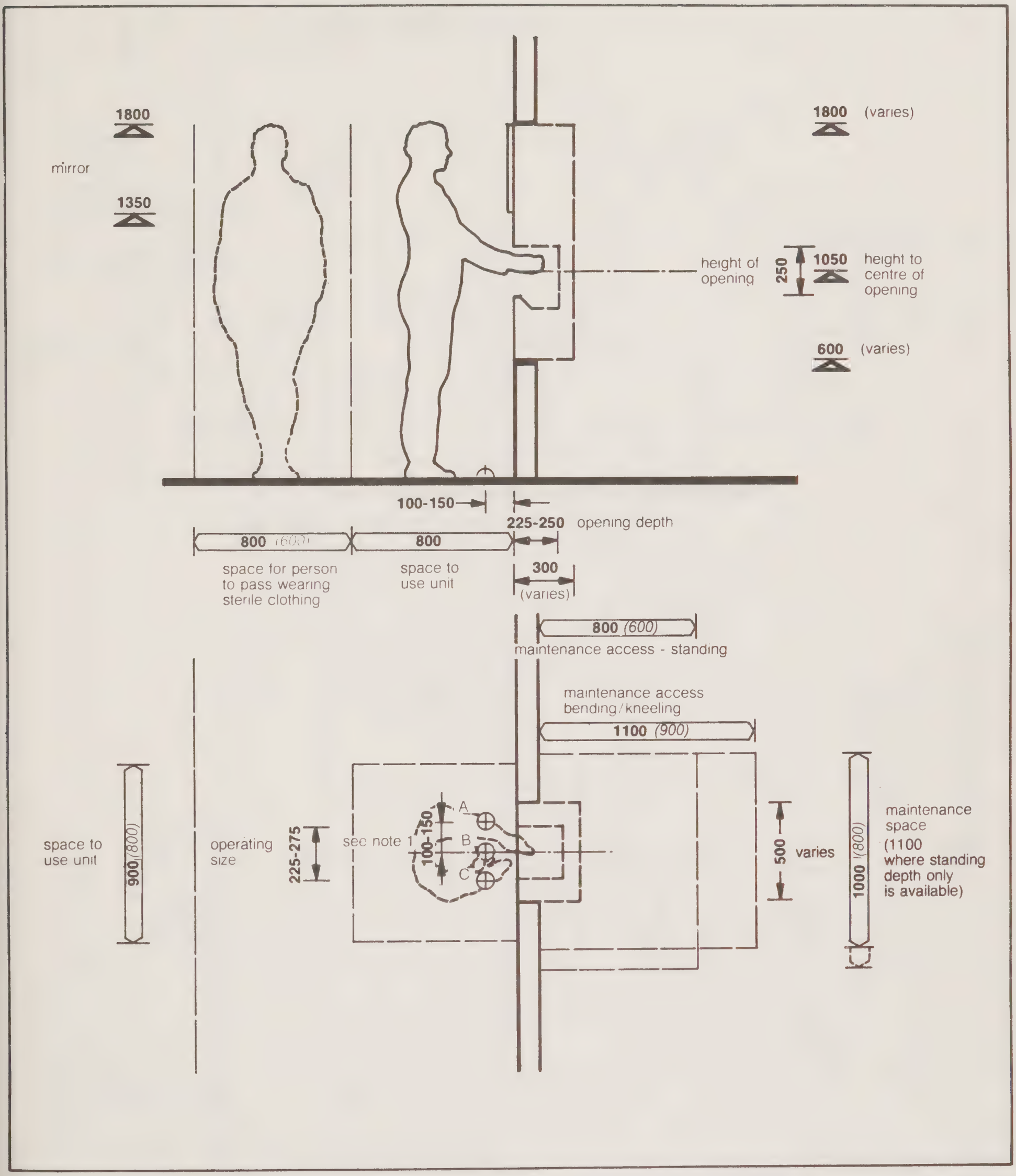
Hinged doors take up more room for opening and can encroach on adjacent worktops or equipment. Sliding doors (particularly vertically moving ones) should be light and the design should allow easy cleaning procedures.

**Activities**
washing hands and lower forearms using unit with foot operated controls of, liquid soap, hot water and warm air drying.

DHSS **Ergonomic data bank**
Component-user data sheet, not to scale

# Handwash Unit
(flush, wall mounted)

**Users:**
staff




**1350** *(1300)*

Preferred minimum: *Restricted minimum (not recommended for general use; see explanatory notes)*

Notes:

1. Key to foot controls
   A — soap
   B — water
   C — hot air

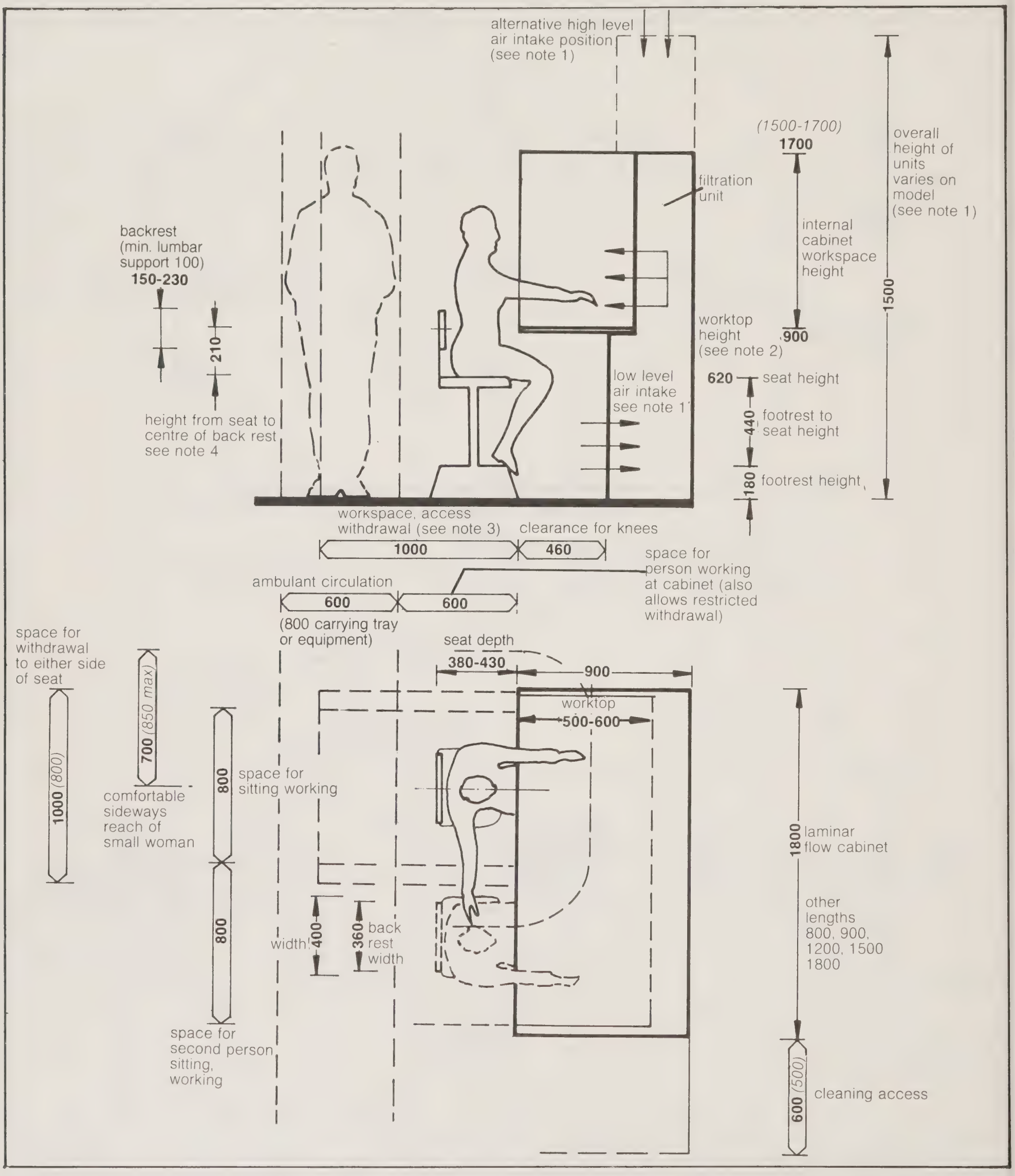
Foot pedal diameter 50mm preferred, displacement 10-20mm. An angled position against wall is possible for foot controls but is less satisfactory - angled pedals should be 100 from wall face and 50-75 above floor level.

**Activities:**
Preparing small quantities of sterile pharmaceutical products using a floor mounted, contained work station with laminar flow.

DHSS **Ergonomic data bank:**
Component-user data sheet, not to scale.

# Laminar Flow Cabinet

**Users:**
pharmacy staff




**1350** *(1300)*

Preferred minimum: *Restricted minimum (not recommended for general use; see explanatory notes)*

Notes:

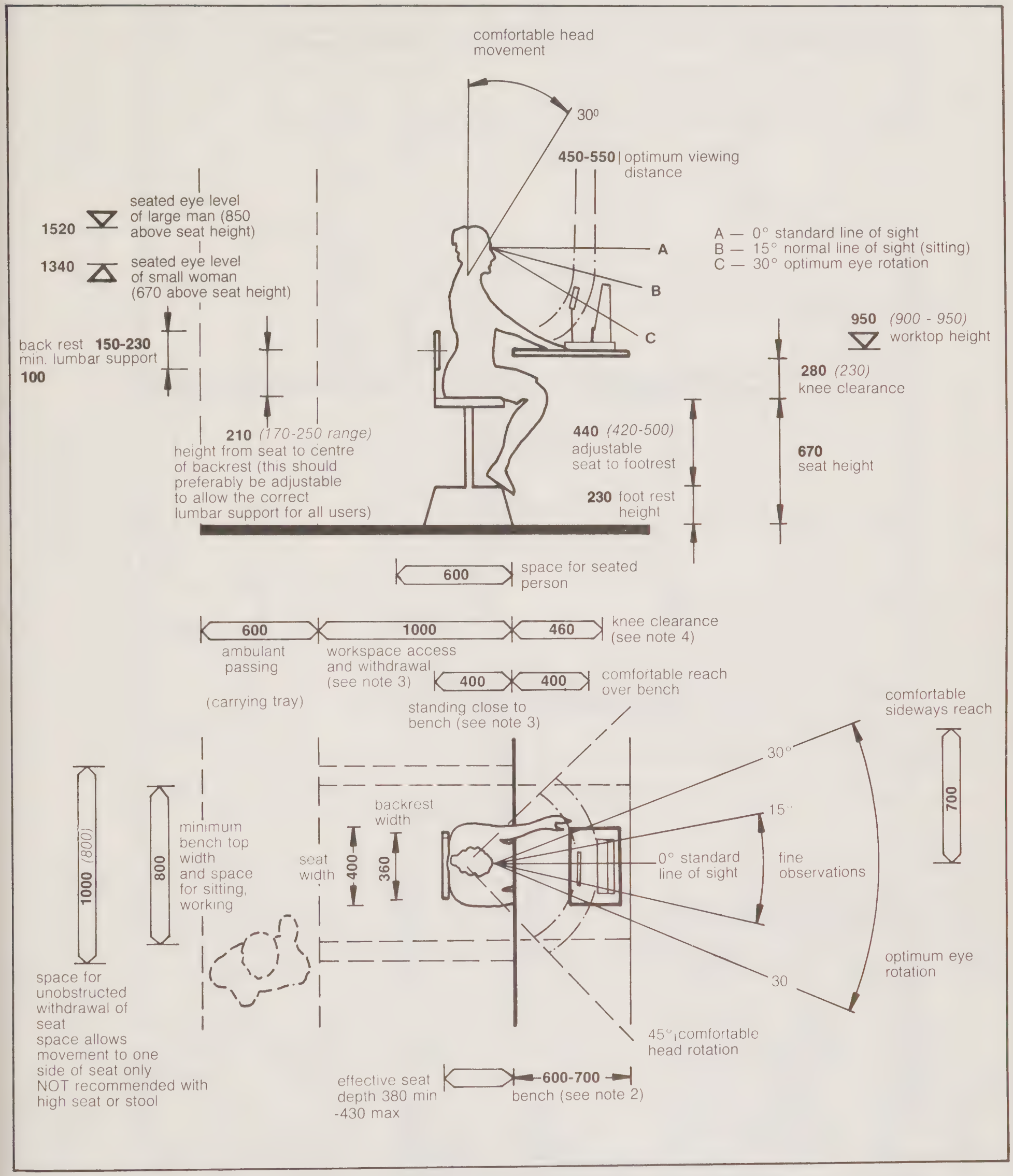
1. A laminar flow cabinet creates a clean, environment at the work station, by taking air in under the worktop or above the unit, purifying it and forcing it out over the work surface (towards the seated person) so protecting the workspace from air borne contamination. Models which provide a vertical downflow of filtered air are also available.
2. The working height of the cabinet at 900 is also convenient for standing use, which may be desirable in some instances. Where however, cabinets are only used by seated personnel, consideration should be given to a lower working height of 720 *(700-750)* which can be used with a normal upright chair (seat height 440 *(420-500 adjustable)*.
3. 1000 also allows occasional ambulant passing *(600)* when worker stands close to cabinet *(400)*.
4. The backrest height should preferably be adjustable to allow correct lumbar support for all users.

**Activities**
examination of liquids

DHSS **Ergonomic data bank:**
Component-user data sheet, not to scale

# Liquid Inspection Viewer

**Users:**
pharmacy staff




**1350** *(1300)*

Preferred minimum: *Restricted minimum (not recommended for general use; see explanatory notes)*

Notes:

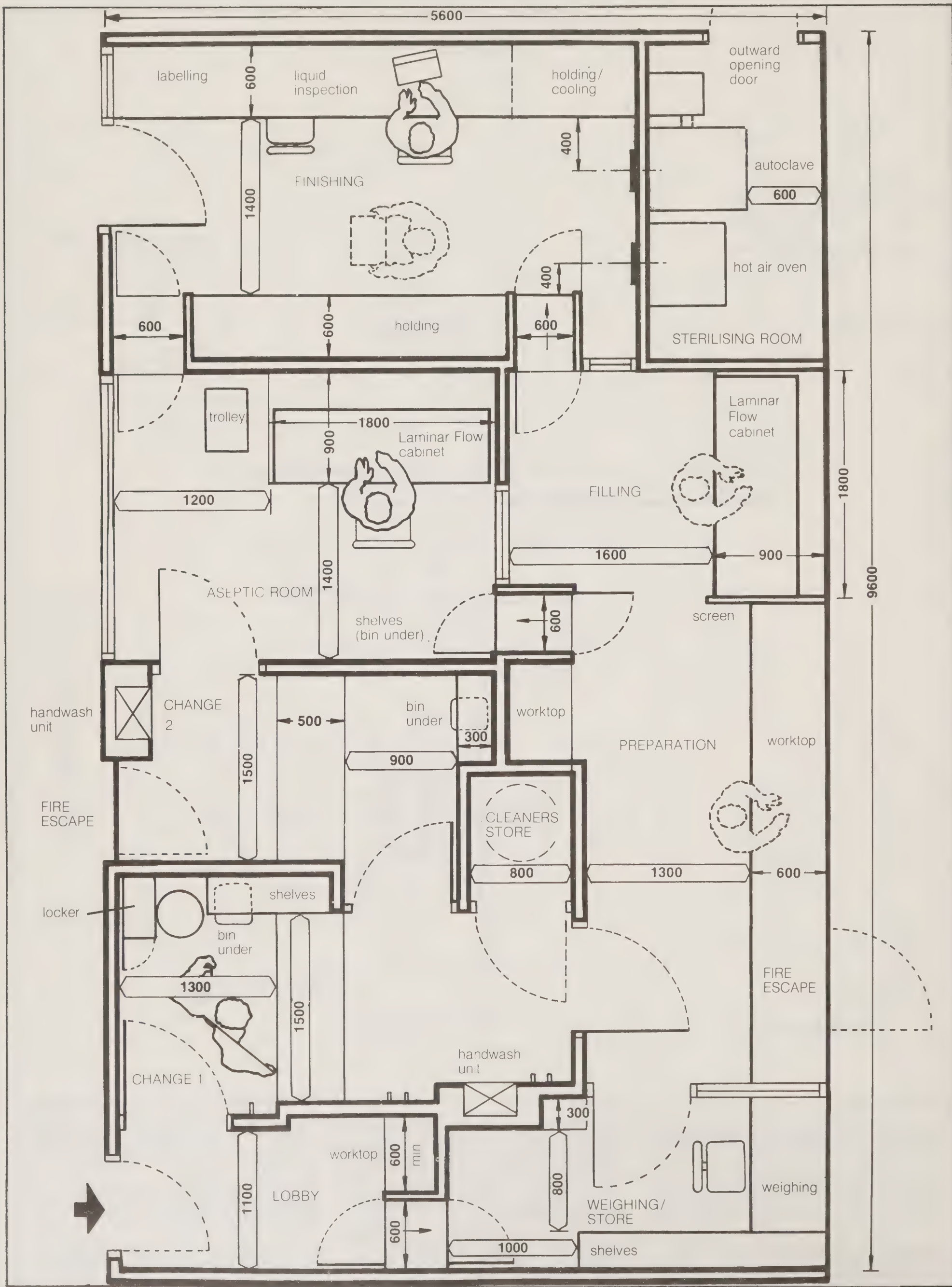
1. The liquid viewer works on the principle of a clear container of liquid sitting between a magnifying lens and a light so that any impurities can be seen (a polarising filter is often fitted).
2. In many cases a 600 bench may be deep enough to hold the liquid viewer at the optimum viewing distance, but in some cases, the focal length of the viewer may be longer, resulting in the need for a deeper bench of 700.
3. 1000 also allows occasional ambulant passing 600 when worker stands close to bench 400.
4. If a footrest is provided as part of worktop unit, then space at footrest level should be full work-top depth ie 600-700.
5. The backrest height should preferably be adjustable to allow correct lumbar support for all users.

Notes:
This unit is designed for the preparation of individual prescriptions for named patients as and when they are needed. (The suite should not be considered as a mini-manufacturing unit, as items will not be prepared for stock). The aseptic room will cater for sterile dispensing of goods which cannot be subjected to terminal heat sterilization, that is injections eg folic acid (filling and sealing ampoules), intravenous additives and total parenteral nutrition.
The preparation room will provide an area to collect the necessary items for the aseptic work, and also cater for the dispensing of individual prescriptions that can be subjected to terminal heat sterilization eg filling large volume fluids (500 ml or 1L).

DHSS **Ergonomic data bank:**
Activity space example layout, not to scale

# Sterile Dispensing Suite

Dimensions shown on this drawing are minimums.

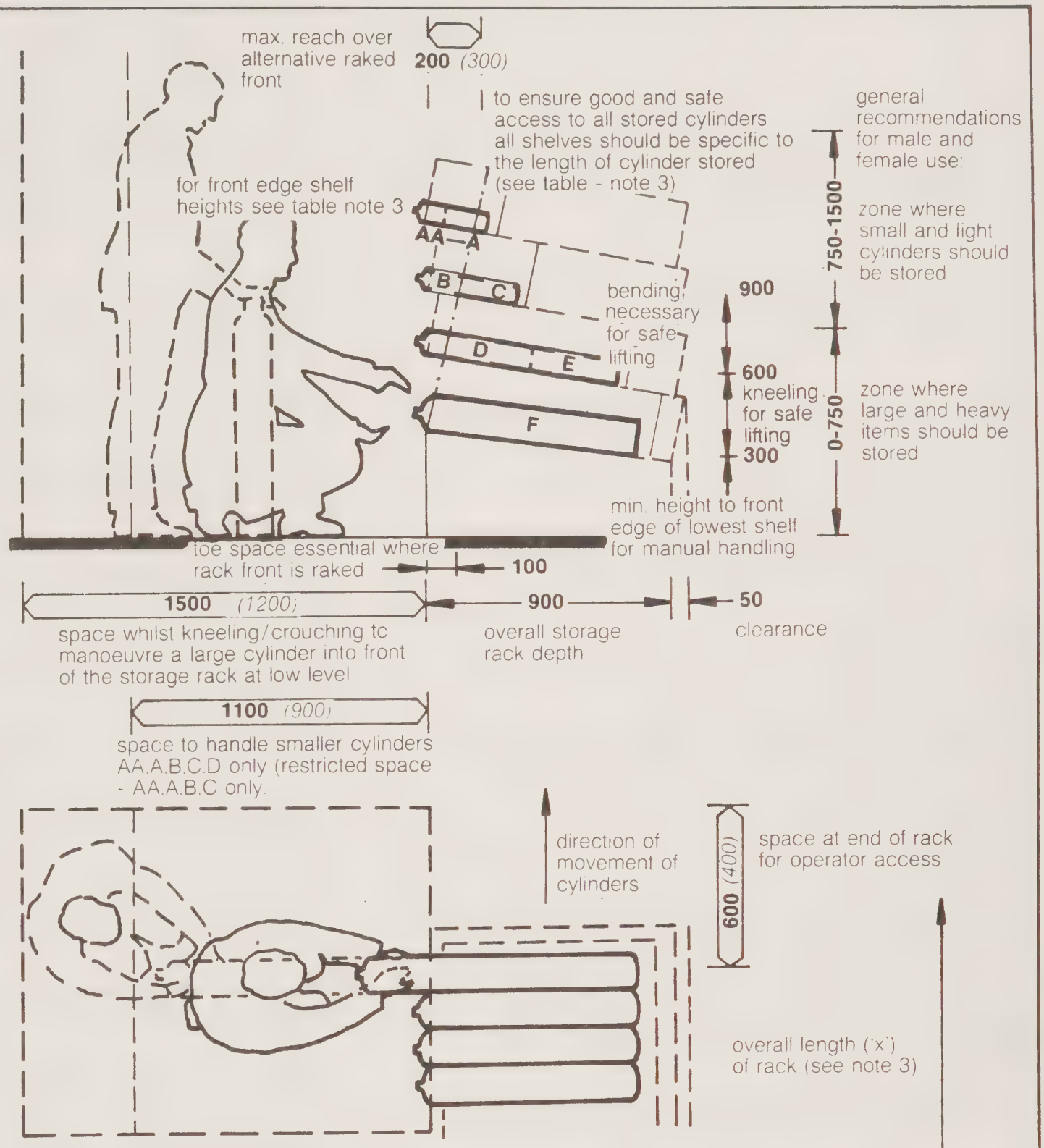


**Activities**
Storage of gas cylinders which due to the nature of the gas must be kept horizontal. also other gases which may be stored more conveniently horizontally for manual handling - see notes .

DHSS **Ergonomic data bank:**
Component-user data sheet, not to scale

# Cylinder Storage Rack

**Users:**
staff, porter/storeman




(1300)

Preferred minimum: *Restricted minimum (not recommended for general use; see explanatory notes)*

Notes:

1. The gas Entonox is a mixture of nitrous oxide and oxygen and should be stored horizontally, as the two gases may separate when the cylinder is stored vertically.

2. This horizontal method of storage almost certainly involves an element of lifting and is therefore only recommended for cylinder sizes AA. A. B. C. D. E and F. The F size cylinder is approximately 870 x 140mm and maximum full weight (which varies on the gas) is 17.5kg. Cylinders larger than this (that is G and J) should not be lifted without the aid of lifting gear.

3 Approximate sizes of cylinders and associated information for racking.

| | Coding (as used by manufacturers) | Full Weights (this depends on gas) | Length (of cylinder) | Max Depth (of shelf) | Diameter (of cylinder) | Minimum Space between shelves | Pref. Max Shelf rim Heights | Men only |
|---|---|---|---|---|---|---|---|---|
| Can be lifted by Men and Women | AA | 0.75 kg | 127 mm | 125 mm | 57 mm | (100 mm) | 1300 | (1450) |
| | A | 1.2 kg | 254 mm | 250 mm | 57 mm | (100 mm) | 1150 | (1300) |
| | B | 2.0 kg | 254 mm | 250 mm | 76 mm | (100-125mm) | 950 | (1100) |
| | C | 3.0 kg | 356 mm | 350 mm | 89 mm | (125-150mm) | 900 | (1000) |
| | D | 3.75-5.0 kg | 457 mm | 450 mm | 102 mm | (150 mm) | 850 | (950) |
| | E | 6.2 -8.8 kg | 788 mm | 775 mm | 102 mm | (150-175mm) | 750 | (850) |
| Lifted by Men only | F | 16.2-17.76 kg | 867 mm | 850 mm | 140 mm | (200-250mm) | | (600) |
| Should not be lifted Manually | G | 39.1-51.5 kg | 1248 mm | | 178 mm | | | |
| | J | 76.82-78.13 kg | 1450 mm | | 229 mm | | | |

Internal rack length = 100 + [ (d x n) + 10% ]
where d = diameter of cylinder
n = Max. no. of cylinders to be stored on each shelf.

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